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ABSTRACT

The Game Overall Director's Manual is one of a set of twenty-one manuals used in METRO-APEX 1974, a computerized college and professional level, computer-supported, role-play, simulation exercise of a community with "normal" problems. Stress is placed on environmental quality considerations. APEX 1974 is an expansion of APEX--Air Pollution Exercise (ED 064 530-550; ED 075 261; ED 081 619), and includes roles for an environmental quality agency, water quality manager, solid waste manager, and various pressure groups, in addition to the previously developed roles of city and county politicians, city and county planners, air pollution control office, developers, industrialists and newspapers. Two industries have been added, as have a number of program options. A recommended "starter set" includes single copies of volumes 1.1, 2.1, 9.1, 11.1 through 18.1, three copies of volume 3.1, five copies of volume 4.1, six copies of volume 5.1, two copies of volume 6.1, three copies of volume 7.1, two copies of volume 8.1 seven copies of volume 10.1, two copies of volume 19.1, three copies of volume 20.1, and six copies of volume 21.1. The METRO-APEX computer program is in Fortran IV and runs on an IBM 360-50 or higher series computer. (BT)

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# METRO-APEX

volume 1.1

## Game Overall Director's MANUAL

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# METRO-APEX

## 1974

A Computerized Gaming Simulation Exercise
For Training in Environmental Management
and Urban Systems

Developed by the
COMEX Project
University of Southern California

through a grant form the
Control Programs Development Division
Environmental Protection Agency

A revised version of the APEX Air Pollution Exercise
developed jointly by the
COMEX Project, University of Southern California
and
Environmental Simulation Laboratory, University of Michigan
June 1974

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COMEX Project
School of Public Administration
University of Southern California

Dr. W. William Leffland,
Co-Principal Investigator
(1966-1970)

Richard T. McGinty,
Principal Investigator
(1970-1974)

Environmental Simulation Laboratory
School of Natural Resources
The University of Michigan

Dr. Richard D. Duke,
Co-Principal Investigator
(1966-1970)

Staff

Mark James
Robert Ross
Andrew Washburn
Jolene Elliott
Wesley Bjur
Alan Forrest
Charles Pratt
Corinne Floyd
Alan Preditor
Ira Robinson
Frank King
Gilbert Siegel
Aubrey Boyd

Staff

Roy Miller
Stewart Marquis
Donald Kiel
Thomas Porton
Paul Ray
Marlyn Miller
James Reeds
Anne Cochran
Ferdinand Dijkstra
David Specht
David Kaueper
Katherine Fenn
Ellen Pechman

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# PREFACE

# PREFACE

METRO-APEX is the result of a long term research and development effort by a number of dedicated individuals. The inspiration, and much of the technical basis evolved from a similar exercise (M.E.T.R.O.) originally developed by the Environmental Simulation Laboratory, University of Michigan. In 1966, a grant from the Division of Air Pollution Control, U.S. Public Health Service was awarded to the COMEX Research Project, University of Southern California, to develop a dynamic teaching instrument, METRO-APEX. Working in close cooperation, the COMEX Research Project and the Environmental Simulation Laboratory successfully developed the initial version of the METRO-APEX exercise in 1971. This computer-based gaming simulation was designed to provide a laboratory urban community in which air pollution management trainees could apply and test the knowledge and skills gained through conventional educational methods.

METRO-APEX has proven to be highly adaptable to training programs dealing with the many aspects of air pollution control including law, management, air quality monitoring, land use planning, budget preparation, citizen participation programs, state and federal grant procedures, and political decision-making processes. As a result, METRO-APEX is in great demand as a valuable supplement to university training programs, and in many cases is being used as a central curriculum focus. Over 60 universities have been trained in the use of METRO-APEX. It has also been translated into French and Spanish and is being used in seven countries outside of the United States.

Based on the success of the initial METRO-APEX program, COMEX was awarded a grant from the Control Programs Development Division of the Environmental Protection Agency to substantially revise and broaden the simulation exercise to encompass the wide spectrum of environmental management issues. This current version, of which this manual is a part, was completed in June 1974 and greatly increases the utility and teaching potential of the exercise. In this version, the interrelationships among air, water and solid waste are demonstrated, the strategies and options available to players have been broadened, new roles have been added, the exercise materials have been updated to reflect the latest technology and nomenclature, and many of the operational problems associated with the earlier version have been rectified.

METRO-APEX is one of, if not the most complex gaming-simulations of an urban area in use today. Although it was designed to supplement standard teaching methods, APEX is far more than an educational tool. It is a communication channel of a new level--capable of providing both the language and the forum for information transfer between persons and groups with different educational and cultural backgrounds as well as different perspectives of the urban situation.

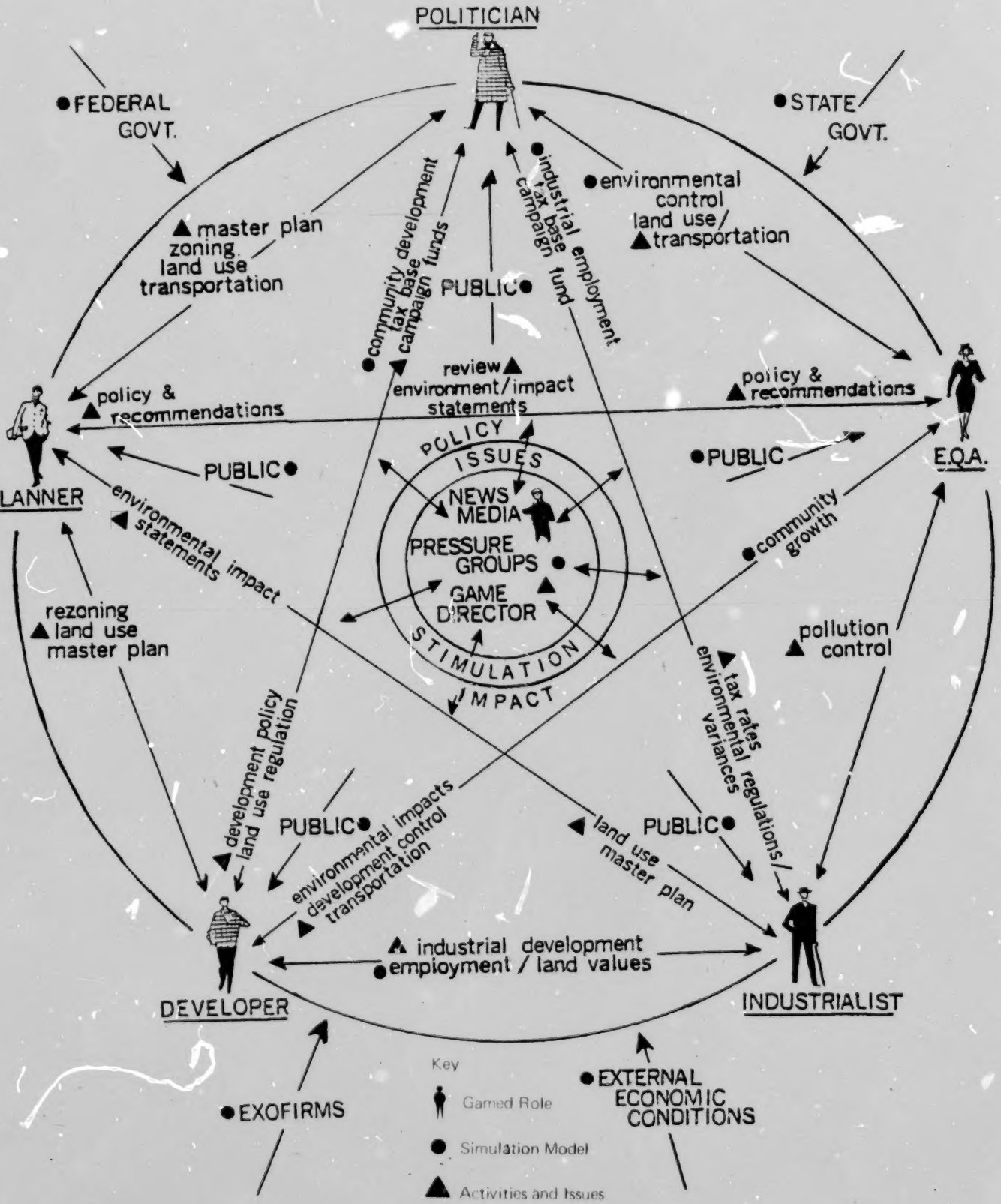
METRO-APEX is composed of two essential components: (1) a computerized system made up of a series of well-integrated simulation models linked to a (2) "gamed" environment encompassing a series of interactive roles. The computerized system predicts the changes that occur in several sectors of the urban system in response to the decisions made by participants in the "gamed" environment, decisions made by persons outside the "gamed" environment (other actors whose behavior is simulated in the computer), and external pressures on the metropolitan area (also simulated in the computer).

The County of APEX is run year by year by principle decision makers performing both the mundane and extraordinary functions of their office in the "gamed" environment. Each cycle or year is condensed in time to a three to eight hour session during which the decision makers formulate their yearly policy. The decisions that emerge out of the "competitive--cooperative" environment of the gaming-simulation are used as priming inputs to the computer simulation. The change in the status of the urban area is calculated by the computer and returned to the decision makers as the primary input to the next cycle of action. Included in the change picture generated by the computer are selected social, economic and physical indicators which show the magnitudes of change in key areas and a newspaper which serves as the focal point of local public opinion.

The key decision makers acting in the gamed environment include an Environmental Quality Agency with departments of Air Pollution, Water Pollution and Solid Wastes; Politicians, Planners and Administrative Officers from a Central City and a County; Land Developers and Industrialists from the private sector; and representatives from the News Media and Pressure Groups. The Politicians are responsible for the administration of their respective jurisdictions and for the formulation and implementation of various programs to upgrade the social status of their constituents. The Planners serve as aides to the Politicians and represent the major long range coordinating force in the community. The Environmental Control Officers are charged with the task of monitoring and alleviating the pollution problems. The private business sectors operate to foster their own interests and frequently those of the community. Pressure Groups and News Media advocate various positions on community issues. Generally, each decision maker finds it to his advantage to coordinate and/or compete with other players in his efforts to promote his strategies. The METRO-APEX General Interaction Diagram included here indicates possible linkages among the roles.

In general, people have great difficulty understanding the dynamics of a complex system through traditional means. Gaming-simulation offers participants the opportunity to study, work with, and discuss the structure of such a system and to experiment with intervention strategies designed to change that structure. When used as a teaching device, the strength of a gaming-simulation such as METRO-APEX lies in the opportunity afforded participants for involvement in the system. When compared with the passive observation of the system offered by traditional methods, this approach has had great success.

# METRO-APEX INTERACTION DIAGRAM



# CHAPTER 1

## A Brief Description of APEX County

Chapter 1

# A BRIEF DESCRIPTION OF APEX COUNTY

## History

The first settlers of APEX County were farm families emigrating from New England and New York State beginning about 1830. During the middle of the nineteenth century, German immigrants continued the settlement patterns of established dispersed family farms. Income to pay for the necessary imports of products from the East was derived primarily from the production of farm crops and, more importantly, timber. Small market towns, often containing milling facilities, developed between 1820 and 1860. At the same time, the County was organized as a unit of government by the State, and the basic network of roads was completed.

The major impetus for the later development of the Central City as a regional center was its selection as the state capitol in 1847. The nation's first land-grant university was established east of the Central City in 1855, further enhancing its growth. Central City was incorporated in 1859 and the Suburb, in which the university was located, was incorporated in 1910. The University's control of a large block of land was to exercise profound influence on the future physical pattern of development. Much of the logical development corridor outward from the City was preempted by this facility.

Steam railroads were first built into APEX County beginning in the 1860's. Those small market-milling communities with stops and depots on the rail lines began to assume a greater importance than the small communities away from the lines. The impact of the railroads on the small communities can be seen from the following description of Central City:

> By the year 1863, the City...was a bustling, urban center. Early accounts tell us that, at that time, the City included eleven churches, five hotels, two flouring mills, three tanneries, two breweries, three saw mills, two sash and blind factories, three iron foundries, two printing offices, several brick yards, and a large number of mechanic shops.*

Although growing, it should be noted that manufacturing was still minimal. Exports were dominated by agricultural and timber products, and most other production was for local consumption only.

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*Tri-County Regional Commission, "History of the Tri-County Region," Information Report 7, updated. pp. 24-25.

Beginning in perhaps 1880, factories producing goods to be exported out of the region were built in the area, fostered by the completion of railroad ties with the rest of the country. These factories, mainly built near railroad depots, stimulated the migration of factory-worker families into the region. Most of these families settled near the factories where they were employed, adding further to the growth of the towns near the railroad. Just before the turn of the century the introduction of the automobile industry into Central City gave the final impetus needed to make Central City into the dominant community in the County. Beginning about the same time, electric interurban railways were extended from Central City to the north, east and west, allowing many workers from the new industries in the City to move further away from their place of employment.

By the 1920's, automobiles had become readily available and their use was encouraged by the paving of most of the roads in the County. Those who had formerly lived fairly close to the interurban system began to be dispersed throughout larger areas and to settle in lower density neighborhoods. Until about 1930, most new development was found in the filling-in of the Central City and Suburb. Although the growth of industrial and bureaucratic functions proceeded in the Central City and the area adjacent to it, the more outlying townships remained, and to some extent still remain, predominantly agricultural. The growing urbanization which has occurred more recently in these fringe areas has been primarily stimulated by the construction of the interstate expressway system beginning in the 1950's.

The interstate highway freeway system in APEX County is shown on the map at the end of this chapter. One major expressway comes from the southeast, sweeps around the southern and western fringes of the City and leaves the County from its northwestern corner. A second expressway comes up from the south, intersects the first and continues northward into the Suburb. It is anticipated that in the future this expressway will be continued northwards, then swing west to finish an expressway loop around the City (dashed line).

In addition to the airport, major transportation into and out of APEX County is provided by rail (primarily freight) and expressway. The attached map outlines the routes of the three rail lines, which generally follow the river valleys and intersect in Analysis Area 8.

A local APEX bus line serves the Central City, with some service extended into the Suburb and nearby areas of the County.

Most travel in APEX is currently by private automobile. There are approximately 2.1 people per registered automobile in APEX. This amounts to approximately one billion automobile miles per year. The automobile is the cause of substantial congestion, property damage, death and air pollution in APEX. Further information about the contribution of the automobile to pollution can be obtained from the Air Pollution Control Officer.

The automobile represents an immense financial burden to owners, political jurisdictions, employers and commercial establishments. Taxes to expand and maintain the road network are constantly expanding. Vast areas of land are required for parking. At the same time, bus ridership is decreasing.

## Political Jurisdictions

In the METRO-AREA game, the County is composed of four autonomous jurisdictions: The Central City, Suburb, Township 1 and Township 2. The County has been further divided into 29 "Analysis Areas", each resembling a census tract. The Central City comprises Analysis Areas 1 through 13; the Suburb, AA's 17 through 19; Township 1, to the west, contains AA's 23 through 28 and Township 2, to the east, contains AA's 14-16, 20-22 and 29. (See map). In addition to analysis areas, the Central City is politically divided into Wards:

Ward 1 -- AA's 1-4
Ward 2 -- AA's 5-8
Ward 3 -- AA's 9-13

Each Ward is the electoral district for one of the three City Council seats represented in the game. The County government (Board of Supervisors) is comprised of members elected from the Suburb, from the Townships, from the County-at-large and the Central City-at-large.

The City Council and County Board of Supervisors are the only two local governmental units actively represented in the game. Other local governments, including the school boards, are simulated. In some cases, City and County governments have parallel functions; e.g. they both provide police services, planning and capital improvements. The County however, has area-wide responsibility for three major services not provided by the City government: public health, welfare and pollution control. In these three areas, County actions, directly affect Central City residents as well as residents in the outlying areas. Both the municipal and County governments derive their primary financial support from the same tax base--real property. County property taxes are paid by land-owners, in addition to property taxes collected by the municipal government and the school board in each political jurisdiction.

Data provided to players in the game are nearly always given by analysis area--this is also the smallest unit of scale in referring to locations; that is, a project or house or industry is located in "Analysis Area X" rather than on a particular street or a particular intersection. Characteristics of each individual analysis area, including the socio-economic composition of the residents and the proportions of land area devoted to particular land uses, may be found in the Planners data.

A few analysis areas are almost completely chacterized by one or two major features which are often referred to throughout play. These major features are given in the following list, with their analysis areas indicated:

Central Business District (CBD) -- nearly all of Analysis Area 8

State Capitol -- Analysis Area 8

Ghetto -- Analysis Area 4 and Analysis Area 8

University -- Analysis Area 19 (all)

"Best" residential areas -- Analysis Areas 9 (all) and 17 (most)

These features are not only unique in the County, but they also dominate the analysis areas in which they are located; in the game they are likely to be referred to as locations in themselves, with no further locational explanation given.

A list of other important man-made features of the County, and their locations, is given later in this chapter.

## Geography and Climate

APEX County is located nearly at the center of an industrialized northern State, some 85 miles northwest of one of the largest metropolitan areas in the United States. The once heavily forested land, extending roughly 320 square miles, is quite flat and for the most part adequately drained for agriculture.

The Great River, a major watercourse in the State, enters the County from the south in Analysis Area 23, meanders north and west, then back to the east and north as it passes through Analysis Area 8. There it is joined by the Red Oak River, which comes in from the east. The enlarged Great River exits from the County in Analysis Area 26, from which it continues west for some 85 miles before emptying in to the Great Lakes. Major drainage of the County is through the Great River system.

Just before it empties into the Great River, the Red Oak River is joined by Sycamore Creek, which wanders up from the southeast. Much of the area in Analysis Areas 11 and 13, near this creek, is low and somewhat marshy, not ideal for heavy development. The other major marshy area in the County is in Analysis Area 14, to the northeast in Township 2. There are also several small lakes in this analysis area and quite a large State Park. The largest lake

in the County is located in Analysis Area 16. This was a primary recreation area in the early part of this century but is less ideal now, due to heavy pollution loads and deteriorating shoreline development. There are small creeks which wander through many analysis areas in the County. The only other river of any significant size, however, is Looking Glass River, which runs east and west through the northern portion of the County, primarily in Analysis Areas 28 and 29.

The climate of APEX County is temperate, with summer temperatures averaging about 70 degrees and winter temperatures which average about 25 degrees. There is an annual rainfall of roughly 41 inches, with heavy snows to be expected primarily in the months of January and February. Prevailing winds are westerly, swinging to the southwest in summer and northwest in winter.

## Major Public Facilities

As might be expected, the Central City and Suburb are significantly better endowed with public capital improvements than are the Townships. The following list includes the most important public structures in the County, and indicates under whose jurisdiction they are operated and where they are located:

Airport (County) -- AA 29, just outside the City limits. The Airport has three runways and a terminal of 27,000 square feet. Two commercial airlines serve the County through this airport; cargo and general aviation are also served.

Boys Training School (State) -- AA 7.

City Hall -- AA 6. This is an old structure, built 80 years ago and considered a scandal. A more central location has been chosen for the new City Hall under construction in AA 8.

Community Centers (City) -- AA's 2, 4, 7, 8, 10, 13. These are mostly old houses purchased by the City to house neighborhood meetings and the operation of special programs.

Community Centers (Township Halls) -- AA's 14 (2), 24, 27, 29.

Community College (County) -- AA 8. The facility is currently housed in an old library and elementary school.

County Building -- AA 8, This includes all County offices and the meeting rooms for the County Board of Supervisors.

County Court House -- AA 8, adjacent to County offices.

Fire Stations (City) -- AA's 2, 3, 4, 5, 6, 8 (2), 11, 12.

Fire Stations (Townships) -- AA's 20, 23, 25. These are modest stations housing limited equipment. Volunteers provide firefighting manpower.

Hospital (County) -- AA 7. This was built in 1912 and was expanded in 1922, 1942, and 1960. It contains 362 beds, including a 35-bed tuberculosis wing, and caters primarily to the indigent. There are three private hospitals in the County with an additional 650 beds.

Library (City) -- AA 8. This is an old downtown building. There are branch libraries in AA's 1, 5, 11, 12 (2), 13.

Library (Suburb) -- AA 18.

Sewage Treatment Plant (City) -- AA 2. This plant provides both primary and secondary treatment and has a capacity of 34 million gallons per day. It currently averages 22 million gallons daily.

Sewage Treatment Plant (Suburb) -- AA 19. This plant provides primary sewage treatment, with a capacity of 12 million gallons per day; it currently handels an average of 6.75 million gallons daily.

Sheriff Station (County) -- AA 8. This is attached to the County Building.

Water Treatment Plant (City) -- AA 8. Water for the City is derived from the Great River as it exits from Analysis Area 8. Capacity is 42 million gallons per day, with the average daily flow currently being 22 million gallons. Treatment includes filtration, purification, flouridation and lime softening.

Water Treatment Plant (Suburb) -- AA 19. The Suburb's water is drawn from the Red Oak River as it enters AA 19. Capacity is 6 million gallons daily.

with current average flow being 2.5 million gallons per day. Treatment includes chlorination, fluoridation and ziolite softening.

Zoo (City) -- AA 7.

## Industry and the Economy

Major employment in APEX County is provided by the State Capitol Complex, the University and a automobile assembly plant, located in Analysis Area 4. While State Government is a stable, slow-growing industry, the University, typical of "research and development" operations elsewhere, is growing at a very rapid rate. The automobile plant exhibits characteristics similar to any large manufacturing operation, fluctuating considerably in response to the national business cycle.

In addition to these "big three" employers, there is a host of industries supplying parts to the automobile industry, as well as independent industries exporting goods which have no relationship to autos. (A map and listing of the major industries in the County are found on the following two pages.) These include the seven gamed industries:

Industry 1 -- Shear Power Company
Industry 2 -- People's Pulp Plant
Industry 3 -- Rusty's Iron Foundry
Industry 4 -- Gestalt Malt Brewery
Industry 4 -- Caesar's Rendering Plant
Industry 6 -- Dusty Rhodes Cement
Industry 7 -- Schick Cannery

Members of the population of APEX County constitute a work force of about 101,000 people, nearly half of them employed by the major "exporting" industries previously mentioned. About 9% of total County employment is found in lighter industry and 41% in commercial and service activities for the resident population. The greatest concentration of manufacturing employment is, as expected, found in the Central City. The highest proportion of white collar workers is in the Suburb, due to the predominance of the University as an employer there. In the futute, it is probable that more and more new industrial growth and employment will occur in outlying areas, particularly among firms requiring significant amounts of land for their plants.

## Population

Within the physical and political environment described in the

preceding pages resides a population of some 227,000 persons, a tiny fraction of whom are represented in METRO-APEX as players. The remainder of the population is simulated by the computer in the game. About 63% of the population resides in the Central City, 10% in the Suburb and the remainder in the two Townships.

Only about 9.2% of the County's population is black; however, virtually all of this population is found in the Central City, of which 14.4% of the total population is black, primarily in Ward 1, where the number of non-white households approaches 38%. The only other significant ethnic minority is found in a Mexican-American community in the east-central portion of the city.

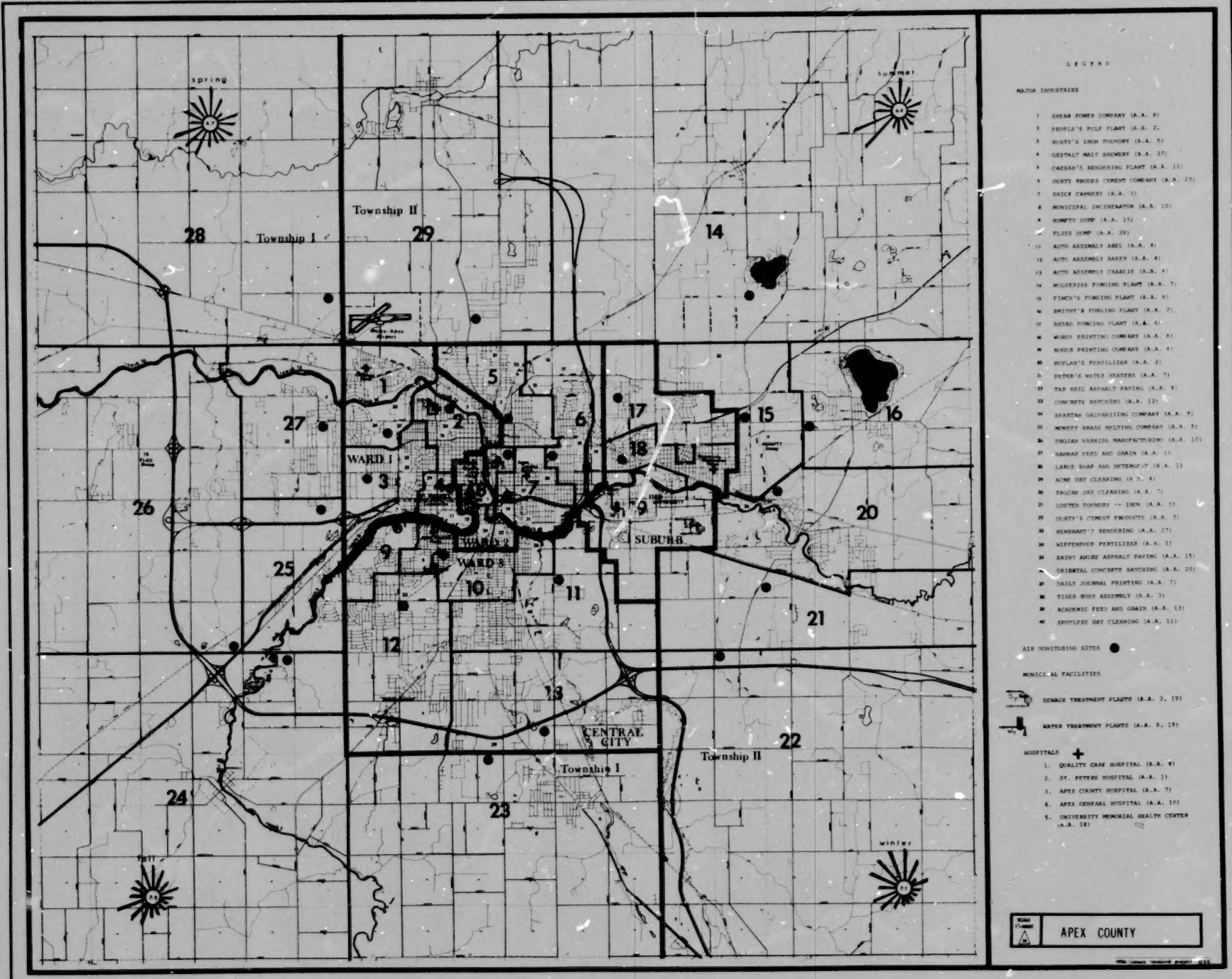
For purposes of the game, the population of APEX County has been divided into five "household types", each representing different occupations and educational achievements, life-styles, voting habits and consumption behavior. These will be described briefly here; more detailed information about each may be found in the Glossary.

Household type 1 is a combination of upper and upper-middle class families whose head of household are likely to be employed in the professions and business management. Household type 2 is typical middle class, occupations usually clerical and lower-level public service areas. Household type 3 includes very low white-collar workers and skilled craftsmen and shop foremen, the latter two predominately. While members of household types 1 and 2 have attended college, some with advanced degrees, household type 3 members are typically high school graduates. In outlying areas, farmers are included in this latter type. In household type 4 are found semi-skilled workers and non-domestic service workers. Usually household heads have not completed high school, and while many household type 4's are homeowners, the value of their housing is quite low. Household type 5 includes laborers, domestic workers and the unemployed, with a large number of the elderly. A majority of these households live in rental units of low value.

Initially, about 17.5% of the County population is found in household type 1, 16% in household type 2 and 27% in type 3; about 32% is of household type 4 and 7.5% fall into household type 5. The household composition of a particular analysis area, and of an entire jurisdiction, will affect significantly the demand for both public and private goods and services. It will also affect voting behavior on financial issues and in elections.

## List of Major Industries

1. Shear Power Company (A.A. 8)
2. People's Pult Plant (A.A. 2)
3. Rusty's Iron Foundry (A.A. 5)
4. Gestalt Malt Brewery (A.A. 27)
5. Caesar's Rendering Plant (A.A. 12)
6. Dusty Rhodes Cement Company (A.A. 23)
7. Schick Cannery (A.A. 3)
8. Municipal Incinerator (A.A. 10)
9. Humpty Dump (A.A. 15)
10. Flies Dump (A.A. 26)
11. Auto Assembly Abel (A.A. 4)
12. Auto Assembly Baker (A.A. 4)
13. Auto Assembly Charlie (A.A. 6)
14. Wolverine Forging Plant (A.A. 7)
15. Finch's Forging Plant (A.A. 6)
16. Smithy's Forging Plant (A.A. 2)
17. Ahead Forging Plant (A.A. 6)
18. Wordy Printing Company (A.A.6)
19. Bogus Printing Company (A.A. 6)
20. Boylan's Fertilizer (A.A. 2)
21. Peter's Water Heaters (A.A. 7)
22. Tar Heel Asphalt Paving (A.A. 8)
23. Concrete Batching (A.A. 12)
24. Spartan Galvanizing Company (A.A. 8)
25. Monkey Brass Melting Company (A.A. 5)
26. Trojan Varnish Manufacturing (A.A. 10)
27. Hannah Feed and Grain (A.A. 1)
28. LaRue Soap and Detergent (A.A. 1)
29. Acme Dry Cleaning (A.A. 4)
30 Trojan Dry Cleaning (A.A. 7)
31. Losten Foundry -- Iron (A.A. 5)
32. Dusty's Cement Products (A.A. 3)
33. Rembrants Rendering (A.A. 27)
34. Wiffenpoof Fertilizer (A.A. 1)
35. Saint Andre Asphalt Paving (A.A. 15)
36. Oriental Concrete Batching (A.A. 20)
37. Daily Journal Printing (A.A. 7)
38. Tiger Body Assembly (A.A. 3)
39. Academic Feed and Grain (A.A. 13)
40. Spotless Dry Cleaning (A.A. 11)


spring
summer
Township II
Township I
28
29
14
27
WARD I
1
2
3
5
6
17
18
15
16
26
20
SUBURB
WARD 2
WARD 3
9
10
11
25
21
12
13
CENTRAL CITY
Township II
Township I
22
24
23
fall
winter
LEGEND
MAJOR INDUSTRIES
1 SHEAR POWER COMPANY (A.A. 8)
2 PEOPLE'S PULP PLANT (A.A. 2)
3 RUSTY'S IRON FOUNDRY (A.A. 5)
4 GESTALT MALT BREWERY (A.A. 27)
5 CAESAR'S RENDERING PLANT (A.A. 12)
6 DUSTY RHODES CEMENT COMPANY (A.A. 21)
7 SHICK CANNERY (A.A. 3)
8 MUNICIPAL INCINERATOR (A.A. 10)
9 HUMPTY DUMP (A.A. 15)
10 FLIPS DUMP (A.A. 26)
11 AUTO ASSEMBLY ABEL (A.A. 4)
12 AUTO ASSEMBLY BAKER (A.A. 4)
13 AUTO ASSEMBLY CHARLIE (A.A. 4)
14 WOLVERINE FORGING PLANT (A.A. 7)
15 FINCH'S FORGING PLANT (A.A. 6)
16 SMITHY'S FORGING PLANT (A.A. 2)
17 AHEAD FORGING PLANT (A.A. 6)
18 WORDY PRINTING COMPANY (A.A. 8)
19 BOGUS PRINTING COMPANY (A.A. 4)
20 BOYLAN'S FERTILIZER (A.A. 2)
21 PETER'S WATER HEATERS (A.A. 7)
22 TAR HEEL ASPHALT PAVING (A.A. 8)
23 CONCRETE BATCHING (A.A. 12)
24 SPARTAN GALVANIZING COMPANY (A.A. 9)
25 NEWFRY BRASS MELTING COMPANY (A.A. 5)
26 TROJAN VARNISH MANUFACTURING (A.A. 10)
27 HANNAH FEED AND GRAIN (A.A. 13)
28 LARGE SOAP AND DETERGENT (A.A. 1)
29 ACME DRY CLEANING (A.A. 4)
30 TROJAN DRY CLEANING (A.A. 7)
31 LOSTEN FOUNDRY -- IRON (A.A. 5)
32 DUSTY'S CEMENT PRODUCTS (A.A. 2)
33 REMBRANDT RENDERING (A.A. 27)
34 WIFFENPOOF FERTILIZER (A.A. 1)
35 SAINT ANDRE ASPHALT PAVING (A.A. 15)
36 ORIENTAL CONCRETE BATCHING (A.A. 20)
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APEX COUNTY

# CHAPTER 2

## Glossary and Reference Terms

## Chapter 2

## GLOSSARY AND REFERENCE TERMS

ABATEMENT

Abatement is the reduction of pollutant emissions from a source or sources.

AEROBIC

A process taking place in the presence of oxygen; or a state of liquid containing free dissolved oxygen.

AIR POLLUTION

Air pollution is the presence in the outdoor air of substances which, when present in a sufficient quantity or over a period of time, can cause an undesirable effect upon man, property, or the environment.

AIR POLLUTION REGULATIONS

Air pollution regulations are legal constraints on pollutant emissions, production processes, or control systems. State regulations and County regulations are enforceable by legal sanctions, while recommendations are not.

AIR QUALITY (See NATIONAL AMBIENT AIR QUALITY STANDARDS)

Air quality refers to the pollution concentration characteristics of the atmosphere or ambient air in a given area. It is usually stated in terms of the levels of concentration of specific pollutants, in micrograms of pollutant per cubic meter of air (Mgm/m3) (See CONCENTRATION).

Air Quality Goals are expressions of desirable maximum pollutant concentrations to be achieved through a pollution control program.

Air Quality Criteria - The basic medical and technical information which forms the rationalization from which Air Quality Standards are set. This information is published for each major pollutant by EPA in Air Quality Criteria Documents.

Air Quality Standards are quantitatively-specified maximum levels of pollutant concentrations or dosages, as more precise statements of air quality goals.

AIR QUALITY CONTROL REGION

One of the approximately 250 geographic areas covering the United States which form the basic units for air pollution control activities. These areas were designated by EPA (with the states) and are based on considerations of climate, meteorology, topography, urbanization and other factors affecting air quality.

ALERT STAGES

Alert Stages refer to critical levels of concentration or dosage signaling potential disastrous pollution effects and requiring emergency abatement and control measures.

ANAEROBIC

A process taking place in the absence of oxygen; or a state of liquid containing no free dissolved oxygen.

ANALYSIS AREA (A.A.)

Analysis areas are used as the primary areal reference units for the data and issues throughout the game. The County is divided into a number of analysis areas, each of which is the approximate size of several census tracts. The analysis areas included in the five jurisdictions are as follows:

Jurisdiction 1-- Central City: Ward 1 = AA 1 through AA 4
Ward 2 = AA 5 through AA 8
Ward 3 = AA 9 through AA 13

Jurisdiction 2-- Suburb: AA 17 through AA 19

Jurisdiction 3-- Township 1: AA 23 through AA 28

Jurisdiction 4-- Township 2: AA's 14-16, 20-22, 29

Jurisdiction 5-- County: AA's 1-29

See APEX Analysis Area Map

ANNUAL WAGE

This is the annual cost to the Industrialist of one worker and is an average of the various rates of pay applicable to the different types of workers in the firm. The applicable average wage rate for each firm is reported in the Industrialist's printout each cycle under cost factors. This wage rate may be subject to negotiations with the labor representative and this new negotiated wage rate will supercede the rate found under cost factors on his printout.

ASSESSED VALUE

Assessed value is the value assigned to real estate property for purposes of assessing taxes owed to each of the jurisdiction County and school districts. Governments are required by law to maintain an assessed value of 50% of market value for propert in their jurisdiction, although this requirement is often not met. (E.g. if a residential property is valued on the market at $20,000, its assessed value is $10,000.) (See STATE EQUALIZED VALUE.)

BACKGROUND LEVEL

The amount of pollutants due to natural sources such as marsh, gas, pollen, conifer hydrocarbons and dust.

BOARD OF DIRECTORS

Each Industrialist acts as a Plant Manager and is responsible to the Board of Directors of his plant for his decisions and actions. The Board has the ultimate decision-making power in plant affairs and may approve, amend or reject the manager's fiscal policy proposal. The Board also sets the amount of dividends to be paid to the stockholders.

BONDING

Bonding is the process of incurring public debt to finance some capital improvement project. It is a device used to extend the incidence of costs over a long period of time, rather than have costs met out of current revenues while the project is under construction. Politicians may issue two kinds of bonds general obligation bonds and revenue bonds. These differ in three respects: (1) the need for voter concurrence, (2) how they are paid off, and (3) the kinds of projects for which they are appropriate. Before Politicians may float general obligatic bonds to finance projects, voters must approve this action in a referendum. There is a State-imposed limit on the indebtednes that a jurisdiction may incur through general obligation bonds. The amount of additional bonded indebtedness that can be sought is indicated in the Politician's output as "$ Limit on Next G.O. Bond Sought". (See DEBT RETIREMENT for the process of financing general obligation bonds.)

Revenue bonds are not submitted to a referendum and are appropriate only for particular projects. (Projects for which they may be used are noted in the Project List.) They are paid off thro fees collected for the service provided by the facility, rather than by taxes.

CAPITAL PLANT INDEX (C.P.I.)

The capital plant index is a ratio of the present dollar value of public capital facilities (sewers, water lines, streets, parks and miscellaneous public holdings) to population equivalents. This number reflects the load imposed on facilities by residents, employees and clients, and this is considered an indication of the relative level of adequacy of these facilites. Present dollar value is calculated each cycle on the basis of depreciated value of existing facilities plus new facilites. (Facilities depreciate at about 5% of original value per year.) (See POPULATION EQUIVALENT.)

CASH CARRYOVER

This is the cash reserve which an Industrialist or Developer carries over to the next cycle after making all his expenditure including those for capital plant. It represents uncommited funds, which the player is free to use in the next cycle.

CASH TRANSFER

A cash transfer is used for loans or gifts of cash between players when the reason for the exchange is unspecified. Revenues made, or expenditures incurred, through an exchange of cash between either the Government, Industrialist, or Developer, are recorded in the budget section of their printout. When applicable, cash transfers are also used to cover the cost of television time and newspaper articles.

CLEAN AIR ACT AMENDMENTS OF 1970

(See LEGAL REFERENCE MANUAL.)

COLLECTION/DISPOSAL STUDY

Studies of municipal house-to-house refuse collection using combinations of different truck types, crew sizes, container locations, transfer stations and disposal sites to determine the capital and operating costs of alternative systems.

COLLOIDAL PARTICLES

Very fine particles of material in fluid suspension; particles will not settle out and can pass through a semipermeable membra

COMBUSTION

Combustion is the process of burning.

CONCENTRATION

Concentration is the ratio of pollutants to effluent gases or ambient air, measured in micrograms per cubic meter (MG/cubic meter) as a weight to volume ratio. Data on mean concentration per quarter, concentration on worst day, and number of days above a specified concentration can be obtained by the APCO, through the installation and operation of monitoring stations.

CONTAMINANT

(See POLLUTANT)

CONTROL EFFICIENCY

Control efficiency refers to the ratio of the amount of a pollutant removed from effluent gases by a control device to the total amount of pollutant without control.

CONTROL STRATEGY

A comprehensive plan designed to control or reduce the level of a pollutant or pollutants in the environment.

CONTROL SYSTEM

Control system refers to equipment and/or procedures intended to reduce the amount of a pollutant, or pollutants, in effluent gases. Each gamed industrial firm has a limited set of control system options for each production process and combustion proces

DEBT RETIREMENT (Debt Service)

Debt retirement, or debt service, is a term used to describe the process of paying off long-term general obligation bonds sold by public agencies. Debt retirement is a budget category of the Politician which includes expenditures for both principal and interest on general obligation bonds. Financing of these expenditures may be with either normal millage or debt retirement millage.

DEMOLITION COSTS (Clearance Costs)

A demolition cost of 5% of the assessed value of developed PROPERTY must be paid when developed land is rezoned.

DENSITY

In residential areas, density is the term used to express the number of dwelling units per acre of land. In APEX County a different density is associated with each of the five residentia

development types, with the lowest density found in land use category R-1 and the highest in category M-2.

The table on the following page expresses housing density in housing units per acre, and in acres per housing unit.

## DEPRECIATION ALLOWANCE

Each cycle, the total value of industrial capital facilities, (building and equipment) depreciates at 8%. A tax credit of 5% of the capital value of these facilities is allowed the Industrialist to compensate for this depreciation. The amount is deducted before Federal and State income taxes are paid. The Industrialist may claim any part of his maximum allowance; any portion of the allowance not taken will accumulate. The maximum depreciation allowance is listed under cost factors in the Industrialist's printout.

## DEVELOPMENT TYPES AND COSTS

### A. Residential

In APEX County there are various levels of cost and density associated with different qualities and sizes of housing which may be built by Developers. These costs are for structures, exclusive of land and site improvements.

#### Single Family

Three different development-cost levels are applicable to APEX County single-family housing units, ranging from the highest construction cost of $40,000 (designated as R-1) to the lowest cost housing, built at $15,000 per unit (designated as R-3). Any one of these types may be built on land which, when vacant, is zoned R.

#### Multiple Family

Units of two different cost levels, M-1 and M-2 are available for construction of multi-family housing in APEX County. The highest cost per unit, for M-1, is $30,000 and the lowest, for M-2, is $12,000. Either of these types may be constructed on vacant land zoned M.

Residential Development Costs Per Unit

| R-1 | R-2 | R-3 | M-1 | M-2 |
|---|---|---|---|---|
| $40,000 | $22,500 | $15,000 | $30,000 | $12,000 |

HOUSING DENSITY

| AA | R-1 | | R-2 | | R-3 | | M-1 | | M-2 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Units Per Acre | Acres Per Unit | Units Per Acre | Acres Per Unit | Units Per Acre | Acres Per Unit | Units Per Acre | Acres Per Unit | Units Per Acre | Acres Per Unit |
| 1 | 1.4 | .714 | 3.5 | .286 | 5.6 | .179 | 11.2 | .089 | 21.0 | .048 |
| 2 | 2.4 | .410 | 6.0 | .167 | 9.6 | .104 | 19.2 | .052 | 36.0 | .028 |
| 3 | 2.0 | .500 | 5.0 | .200 | 8.0 | .125 | 16.0 | .063 | 30.0 | .033 |
| 4 | 2.8 | .357 | 7.0 | .143 | 11.2 | .089 | 22.4 | .045 | 42.0 | .024 |
| 5 | 2.1 | .476 | 5.25 | .190 | 8.4 | .119 | 16.8 | .060 | 31.5 | .032 |
| 6 | 1.6 | .625 | 4.0 | .250 | 6.4 | .156 | 12.8 | .078 | 24.0 | .042 |
| 7 | 2.5 | .400 | 6.25 | .160 | 10.0 | .100 | 20.0 | .050 | 37.5 | .027 |
| 8 | 3.0 | .333 | 7.5 | .133 | 12.0 | .083 | 24.0 | .042 | 45.0 | .022 |
| 9 | 1.2 | .833 | 3.0 | .333 | 4.8 | .208 | 9.6 | .104 | 18.0 | .056 |
| 10 | 2.5 | .400 | 6.25 | .160 | 10.0 | .100 | 20.0 | .050 | 37.5 | .027 |
| 11 | 1.0 | 1.000 | 2.5 | .400 | 4.0 | .250 | 8.0 | .125 | 15.0 | .067 |
| 12 | 1.0 | 1.000 | 2.5 | .400 | 4.0 | .250 | 8.0 | .125 | 15.0 | .067 |
| 13 | 1.0 | 1.000 | 2.5 | .400 | 4.0 | .250 | 8.0 | .125 | 15.0 | .067 |
| 14 | .5 | 2.000 | 1.25 | .800 | 2.0 | .500 | 4.0 | .250 | 7.5 | .133 |
| 15 | .6 | 1.667 | 1.5 | .667 | 2.4 | .417 | 4.8 | .208 | 9.0 | .111 |
| 16 | .8 | 1.250 | 2.0 | .500 | 3.2 | .313 | 6.4 | .156 | 12.0 | .083 |
| 17 | 1.2 | .833 | 3.0 | .333 | 4.8 | .208 | 9.6 | .104 | 18.0 | .056 |
| 18 | 2.3 | .435 | 5.75 | .174 | 9.2 | .109 | 18.4 | .054 | 34.5 | .029 |
| 19 | 3.0 | .333 | 7.5 | .133 | 12.0 | .083 | 24.0 | .042 | 45.0 | .022 |
| 20 | .8 | 1.250 | 2.0 | .500 | 3.2 | .313 | 6.4 | .156 | 12.0 | .083 |
| 21 | .5 | 2.000 | 1.25 | .800 | 2.0 | .500 | 4.0 | .250 | 7.5 | .133 |
| 22 | .4 | 2.500 | 1.0 | 1.000 | 1.6 | .625 | 3.2 | .313 | 6.0 | .167 |
| 23 | .7 | 1.429 | 1.75 | .571 | 2.8 | .357 | 5.6 | .179 | 10.5 | .095 |
| 24 | .3 | 3.333 | .75 | 1.333 | 1.2 | .833 | 2.4 | .417 | 4.5 | .222 |
| 25 | .4 | 2.500 | 1.0 | 1.000 | 1.6 | .625 | 3.2 | .313 | 6.0 | .167 |
| 26 | .3 | 3.333 | .75 | 1.333 | 1.2 | .833 | 2.4 | .417 | 4.5 | .222 |
| 27 | .6 | 1.667 | 1.5 | .667 | 2.4 | .417 | 4.8 | .208 | 9.0 | .111 |
| 28 | .3 | 3.333 | .75 | 1.333 | 1.2 | .833 | 2.4 | .417 | 4.5 | .222 |
| 29 | .5 | 2.000 | 1.25 | .800 | 2.0 | .500 | 4.0 | .250 | 7.5 | .133 |

B. Commercial

Two types of commercial land use are allowable in APEX County. These relate to local neighborhood shopping facilities and to regionally-oriented commercial and service facilities. Both may be built only on zoning category "Commercial" land. Each is developed on a cost-per-acre basis, as follows:

Commercial Development Costs by Type

| CL | CR |
|---|---|
| $100,000 | $125,000 |

C. Industrial

Endogenous industrial development permitted Developers in APEX County is on a per-acre basis, the cost being $100,000 per acre. Zoning category I land may be developed into this land use.

(See ZONING CATEGORY.)

DOSAGE

The accumulated exposure of a person, plant, materials, etc., to a particular concentration of pollutant for a specified period of time.

DUMP

A site where uncontrolled disposal of solid waste occurs.

EFFLUENT

An effluent is a gaseous or liquid discharge or emission.

EFFLUENT SAMPLES

An effluent sample is an industrial outflow water sample and analysis which provides data on seven water pollutant parameters. A sample may be ordered by the Water Quality Manager and is taken at the source specified by the WQM.

ELITE OPINION POLL (E.O.P.)

The Elite Opinion Poll calls for a vote of all game players on certain major policy issues in the community. These issues appear as headlines in the METRO-APEX NEWS, which ask for either a deciding or advisory vote. The results of the Poll affect public officials' chances of reelection, as well as the probability of passage of general referenda, specific bond issues and special millage requests.

EMERGENCY EPISODE

An air pollution incident in which high concentration of pollutant(s) occur in the ambient air contributing to a significant increase in illness or death.

EMISSIONS

Emissions are pollutants in effluent or exhaust gases which are released into the air.

EMISSION FACTORS

Emission factors are estimates which can be used to approximate the rate of emissions of specific pollutants from generalized sources.

EMISSION INVENTORY

A compilation of the rate of pollution emissions in a given area by source type.

EMISSION MEASUREMENT

Air pollution emissions are measured in pounds per hour for particulates, sulfur dioxide (SO2), carbon monoxide (CO), nitrogen oxides (NOx), and hydrocarbons (HC); in Ringelmann number for smoke; and in Stinkelmann number for odor. The emissions measured are of specific pollutants from specific sources.

EMISSION RATE

Emission rate refers to the amount of pollutant emitted per unit of time or throughput. Maximum allowable emissions will be specified in pounds per hour (or pounds per 1000 pounds of process rate) if they refer to emission rates.

EMISSIONS SOURCE

An emission source is the origin of some specific air pollutants. In the game there are several gamed point sources, about thirty non-gamed point sources, plus motor vehicles and space heating as line and area sources, respectively.

ENVIRONMENTAL IMPACT STATEMENT

The results of a study which identifies and evaluates the adverse or beneficial environmental effects of pursuing a proposed action, pursuing an alternative action or not pursuing the proposed action.

EXOFIRM (EXOGENOUS FIRM)

An Exofirm is an industry or bureaucratic firm that depends primarily upon markets outside the local area for its growth and vitality. These firms are usually classified as Exofirms on the basis of their being net importers of dollars and net exporters of products or services to these outside markets. Jobs created by Exofirm growth spur additional growth of households and jobs oriented to the local market. (Exofirms are also often referred to as basic firms).
In APEX County, Exofirms locate in industrial and office zoning categories. Periodically, the newspaper will note the opportunity for Developers or Industrialists to invest, in a speculative way, in the entry of new Exofirms into the metropolitan area, with a variable probability of success attached to such investments. Occasionally, these Exofirms require rezoning of land and/or installation of special capital improvements. Requirements for such special public action and requests for private investment will be noted in the newspaper announcement of the firm's interest in locating in the area.

FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1972

(See LEGAL REFERENCE MANUAL)

FUEL RATE

The amount of fuel consumed by each industry per unit of time is specified in tons/hours for coal, in barrels (bbl)/hour for oil, in thousand cubic feed (MCF)/hour for natural gas, and in megawatts (MW) for electricity.

FUEL TYPE

The fuel types for industry include: low-grade coal (Lo-Coal), high-grade coal (Hi-Coal), low grade oil (Lo-Oil), high-grade oil (Hi-Oil), natural gas, and electricity. The fuel option for each plant is listed in the Industrialist's printout. The fuel grade refers inversely to the air pollution potential of the burining fuel, i.e., Lo-Grade has higher pollution potential, and Hi-Grade fuels have low pollution potential.

GARBAGE

The food waste portion of solid waste.

HAZARDOUS AIR POLLUTANTS

Air pollutants not covered by the Air Quality Standards but which, in EPA's judgement, "may cause, or contribute to, an increase in mortality or --- serious illness." These pollutants generally are toxic substances such as mercury, cadmium, asbestos and beryllium.

HAZARDOUS WASTE

(See "SOLID WASTE TYPE")

HOUSEHOLD/COMMERCIAL REFUSE

(See "SOLID WASTE TYPE")

HOUSEHOLD TYPES

The five household types used in APEX County are characterizations of families belonging to fairly homogeneous socio-economic groups. These characterizations reflect life style, political involvement and voting habits, general consumption behavior and preference for public goods. There is substantial overlap of income levels for all status groupings; hence income, alone, is a weak indicator for characterizing households.

Household Type 1 -- is upper class and upper-middle class combined. Occupations of the heads of households are: professionals, technical workers, managers, officials, and proprietors. One-half of the family income levels are in excess of $15,000 and the other half are in the $10,000-$15,000 range. Value of housing is in excess of $20,000, and if they rent, rentals are over $150 per month. This is the group which is most concentrated in residential locations. Education of the head of the household is at least college graduate, often with post-graduate study. Interest group membership for this household type is found in the Business Community and Effective Government Groups.

Household Type II -- is the typical middle-class household in which the head of households occupation is clerical, sales, or kindred types. Income of the family is primarily in the $7,000-$10,000 range. Education of the head of the household is some college or at least high school graduation.

Housing value is primarily in the $15,000-$25,000 range, and gross rentals would usually be from $100 to $149 per month, though they may be somewhat lower. Interest group affiliations for this type are with the Effective Government Groups on the one hand, and with the Right-wing Conservatives on the other.

Household Type III -- the most numerous and widely-distributed of the five types is characterized by a mixed membership of very low income white collar workers, skilled craftsmen, and foremen, though the latter two predominate. In the outlying areas, farmers fall into this category. Family income is primarily in the $5,000-$9,000 range. The head of the household's education is typically high school graduation. Housing value is usually in the $12,000-$20,000 range and rentals are from $80-$125 per month. Members of this group are apt to belong to the Labor Vote and/or the Right-wing Conservative interest groups.

Household Type IV -- is composed of semi-skilled workers, industry operatives and non-household service workers, such as waiters, barbers and parking-lot attendants. Family income is in the lower portion of the $4,000-$7,000 range. Housing values range from $10,000 to $14,000 with gross rentals being $70 to $90 per month. Education of the head of the household is usually 9 to 11 years. Interest group membership for this household type is found in the Labor Vote and among the Civil Rights Groups.

Household Type V -- is the lowest stratum of society, and heads of households are laborers or household service workers. The vast majority of the area's unemployment are of this type and roughly half of all members are elderly and retired. Family income is less than $5,000 annually and the value of housing is less than $10,000, with rentals primarily $50-$75 per month. Heads of households have usually not been educated beyond the eigth grade. Membership in interest groups is found in the Labor Vote and Civil Rights Groups.

Political involvement of the five household types declines from Type I (the highest) to Type V, the latter being generally apathetic. Likewise, concern with government operation and provision of public services is highest in Type I households and declines steadily through Type V families.

The five household types will tend to demand housing of the five residential development types according to the following percentages:

Household Type I -- 50% will choose R-1; 30% R-2 and 20% M-1

Household Type II -- 20% will choose housing in each of the five development types

Household Type III -- 10% prefer R-1; 30% prefer R-2; 20% choose R-3; 25% take M-1, and 15% M-2

Household Type IV -- 20% will choose R-2; 40% R-3; 10% M-1, and 30% M-2

Household Type V -- 40% will be in R-3; 60% in M-2

IMPLEMENTATION PLAN

Under the 1970 Clean Air Act, each state must prepare and have approved by EPA an Implementation Plan which details the methods, strategies and timetable which the state and its jurisdictions will employ to meet and maintain the Air Quality Standards within the control region(s) within its jurisdiction.

IMPROVEMENT COSTS

Improvement costs are fees to prepare raw land for development, including subdivision costs, sewer and water connections, drainage and engineering. Developers are required to pay improvement costs on all land on which they build structures. For residential property, improvement costs are on a per unit basis as follows:

| R-1 | R-2 | R-3 | M-1 | M-2 |
|---|---|---|---|---|
| $1,000 | $800 | $700 | $600 | $400 |

For commercial and local industrial land uses, improvement costs are on a per acre basis; for each the fee is $5,000 per acre.

These fees are automatically applied to all land on which the Developer builds.

INTEREST GROUPS

In APEX County there are 5 major political interest groups that take stands on public policy issues and have a significant impact upon voting behavior. The more extreme the position assumed by one of these interest groups (as indicated on a scale of +4 to -4), the greater will be the voter turnout surrounding any particular referenda or election. Each of these interest groups derive their constituency from among two or more of the "Household Types" (See HOUSEHOLD TYPES)

1. CIVIL RIGHTS GROUPS: The orientation of these groups is primarily towards issues such as fair employment, neighborhood improvement, and problems that affect minorities. Their leadership is drawn from the elite liberals or the ghetto activists, their membership from the lower social strata. Their mode of operation is typically public protest and demonstrations centered around a very specific policy issue or community problem, and their influence on the system as a whole is moderate.

2. EFFECTIVE GOVERNMENT GROUPS: Are overwhelmingly middle class, composed primarily of professional people, a large percentage of them women. These groups are interested in a wide range of issues, on which they exert moderate influence. their orientation is towards governmental efficiency and towards community growth and image.

3. BUSINESS COMMUNITY: Draws from the whole range of commercial and mercantile interests, as well as some from the professional areas such as law, engineering and medicine. The business community exerts the highest degree of power of all politically oriented interest groups; their interest is directed primarily at community image, growth, and "BOOSTERISM".

4. LABOR VOTE: Are more conservative locally than nationally and exhibit some divergency between craft unions and industrial unions, the former being more conservative. The labor vote exert moderate influence on a range of issues somewhat less broad than those of interest to the "Effective Government Groups". The conservatism of the labor vote is especially apparent in the opposition of some of its constituency to public spending for social welfare.

5. RIGHT-WING CONSERVATIVES: Draws its membership primarily from people who resist change and advocate conserving the "traditions of Americanism--God and Country." They are generally against social change, increases in government influence in local affairs and public spending on social programs. Since these groups do not advocate change, they usually only become actively involved in public issues as a reaction to public programs proposed by other groups.

INTEREST RATE

The cost of borrowing money will vary for the Industrialists and Developers according to both their credit rating and the length of the loan, i.e., how many years will be taken to repay it. The maximum number of years on any loan by an Industrialist or Developer is 20 years. Applicable interest rates as follows:

| Years to Repay | Credit Rating A-1 | A-2 | A-3 |
|---|---|---|---|
| 1-2 | 4% | 6% | 8% |
| 3-5 | 6% | 8% | 12% |
| 6-10 | 8% | 12% | 16% |
| 11-20 | 12% | 16% | 20% |

The cost of borrowing money for governmental agencies, the interest rate on bonds, will vary according to the credit rating of the jurisdiction, and will differ between general obligation and revenue bonds. Since revenue bonds are not backed by governmental taxing power they are riskier and therefore carry higher interest rates than general obligation bonds. As a jurisdiction's credit rating falls from A-1 to A-3, the interest rate on general obligation bonds will increase from 4.5% to 6%.

INVERSION

A layer of air trapped near the ground by a layer of warmer air above it.

ISSUE

Issue is used to refer to a problem situation presented to players in the METRO-APEX NEWS. Following each issue are two to four alternatives one of which must be selected by the player.

(See ELITE OPINION POLL)

JURISDICTION

Jurisdiction refers to one of the political units in APEX County. Abbreviations used in the game are:

(Jurisdiction 1) CC - Central City
(Jurisdiction 2) SUB - Suburb
(Jurisdiction 3) TW 1 - Township 1
(Jurisdiction 4) TW 2 - Township 2
(Jurisdiction 5) Co - County

(See ANALYSIS AREA.)

LAND USE

Land use is a term used to refer to the spatial distribution of City and rural functions--its residential communities or living areas, its industrial, commercial and retail business districts or major work areas and its agricultural, institutional and leisure time functions.

(See DEVELOPMENT TYPE and ZONING CATEGORY.)

LEACHATE

Water moving vertically through the soil of a landfill that may become contaiminated from the waste material in the fill.

MAXIMUM PRODUCTION CAPACITY

This is the maximum number of units which can be produced by a gamed industry in a cycle, with the plant and equipment in existence during that cycle. Maximum capacity may be increased by making capital expenditures for building and equipment. New productive capacity becomes available only in the cycle following that in which money is budgeted for plant expansion.

MEAN PROBABLE NUMBER PER 100 ml (MPN/100 ml)

A measure of the amount of coliform organisms per unit volume. By using quantities of sample varying in geometric series i.e., 0.01, 0.1, 1.0 milliliters, and by applying the usual test for coliform organisms, it is possible to determine a statistical estimate or "most probable number" of coliform organisms per 100 ml of water.

MICROGRAMS PER CUBIC METER

The weight of a substance in 1/1,000,000 of a gram contained in one cubic meter of volume.

MILLAGE

Millage is the tax rate, in mills, which is applied to State equalized property value to generate property tax revenue. One mill is equal to a $1 charge on each $1000 of value, or one tenth of one percent of the State equalized value. There are three types of millage:

A. Normal Operating Millage is determined by local Politicians and is applied to standard operating costs of government by State and local law -- the local limit can never be higher than the limit set by the State.

B. Special Millage, which is not subject to State and local limits, can be used for financing special programs. It must be voted and passed on in a referendum.

C. Debt Retirement Millage is not subject to the State and local limits but it can be used for retiring general obligation bonds. This millage requires a favorable vote in a referendum.

Total millage is the sum of operating millage, any special millages and the debt retirement millages which may be in effect during the year.

MILLIGRAMS PER LITER (mg/l)

Weight per unit volume. For water effluents, milligrams per liter is used to express the concentration in terms of the weight in milligrams of a dissolved or suspended pollutant in one liter of water.

MONITORING STATION

A monitoring station is a facility that houses air quality monitoring equipment for measurement of ambient air quality. One air quality monitoring station may be installed and operated in any analysis area. The pollutants measured at each monitoring station are:

Particulates, SO2, CO, NOx, and Hydrocarbons

Each pollutant is measured by a different type of monitoring equipment.

(See AIR QUALITY)

NATIONAL AMBIENT AIR QUALITY STANDARDS

EPA has set Primary and Secondary Air Quality Standards which are the maximum concentration of air pollutants allowable by federal law. Primary Standards are based on protection of the public health and are to be achieved as a first priority. Secondary Standards are based on the public welfare and will be achieved as a second priority.

NATIONAL ENVIRONMENTAL POLICY ACT (NEPA)

(See LEGAL REFERENCE MANUAL)

OFF GASSES

Gasses arising from landfills or other solid waste conversion (such as thermal) operations and leaving the site of generation.

PLANNED UNIT DEVELOPMENT

A planned unit development is an allocation of density to a development site such that the overall density meets the zoning requirements, but within the site certain areas may be of a higher concentration than those other developments around this site. This allows the Developer more flexibility in designing planned neighborhoods.

(See DENSITY)

PLANT INSPECTION

A plant inspection is an "on-site" examination of production and pollution control equipment, processes and procedures. Plant inspections ordered by the APCO will provide him with information on the production processes; production capacity; fuel and process rates; control systems; smoke code (Ringelmann number); and odor code (Stinkelmann number) for each process of a specific gamed or non-gamed emission source.

PLANT MANAGER

The player in the role of Industrialist is acting as a Plant Manager.

(See BOARD OF DIRECTORS.)

POLLUTANTS

Air Pollution:

(1) Particulates: particulate matter is any material (except uncombined water) which exists in a finely divided form as a liquid or solid at standard conditions.

(2) Sulfur Dioxide (SO2) is a pungent colorless gas which is commonly emitted from the combustion of sulfur containing compounds, especially fuels such as coal and fuel oil. Sulfur dioxide can also be emitted from chemical process plants, metal process plants and trash burning incinerators.

(3) Carbon Monoxide (CO) is a colorless, odorless, very toxic gaseous product of the incomplete combustion of common fuels. It can also be generated by metabolic processes and the partial oxidation of carbon-containing compounds such as limestone. Carbon monoxide adversely affects human respiration by interferring with the body's ability to assimilate oxygen.

(4) Oxides of Nitrogen (NOx) are formed when oxygen and nitrogen are heated to a high temperature. Sufficiently high temperatures to produce significant amounts of NOx are normally only reached in modern efficient combustion processes such as electric power plants and automobile engines. Oxides of nitrogen in combination with hydrocarbons and sunlight are major constituents of photochemical smog.

(5) Hydrocarbons (HC) are compounds containing combinations of hydrogen and carbon. Gaseous hydrocarbon air pollutants are most commonly emitted from the incomplete combusion of fuels such as gasoline, coal, oil and gas from the production, handling and evaporation of gasoline, paint thinners, solvents, etc. Hydrocarbons along with oxides of nitrogen and sunlight are important in the generation of photochemical smog.

Water Pollution:

(1) Biological Oxygen Demand - B.O.D. is the amount of oxygen needed by any polluted water or sewage to allow micro-organizms to consume the suspended and dissolved biodegradable organic material found in the liquid under aerobic conditions.

(2) Coliform Bacteria - Micro-organisms found in sewage serving as the indicator of bacterial contamination in water quality.

(3) Dissolved Oxygen (D.O.) is the amount of oxygen found and available for biochemical activity with a given volume of water (mg./l.). The saturation point is dependent upon temperature, chemical characteristics of the water, and barometric pressure.

(4) Nutrients - Nutrients are phospates, nitrates, nitrogen and phosphorus released as waste from certain industries or produced from agricultural and urban runoff.

(5) Thermal Pollution - The increase in temperature of surface waters as a result of the use of these

waters for cooling purposes by industry or public facilities. The heat accelerates biological processes in the stream, resulting in reduction of oxygen content of the water.

(6) Total Dissolved Solids (T.D.S.) - The amount of solids, dissolved in a given volume of water (mg./l).

POPULATION EQUIVALENT

The population equivalent is a means of converting (a) residents, and (b) employees and clients of industries and commercial facilities into a standard measure of the demand placed on such public capital facilities as sewers, streets, and water supply. The population equivalent of an area (analysis area or jurisdiction) is computed as follows:

P.E.= [Total households]+[.3 x all employees of commerce and industry]

For use of population equivalents in APEX County, see CAPITAL PLANT INDEX.

PROCESS RATE

Process rate refers to the amount of materials processed by an Industrialist per unit time. The measure is specified in tons, pounds, barrels, per minute, per hour, etc.

PRODUCTION LEVEL

This is probably the key item determined by an Industrialist each cycle. It is the number of units of a product his plant will produce in that cycle. The Industrialist is free to set his production at any level he chooses, as long as the figure he sets does not exceed his maximum production capacity.

PRODUCTION PROCESS

A production process is a definable part of the overall production system of a given firm. Each gamed industrial firm may have up to five production processes, while each non-gamed industrial firm is assumed to have only one process.

PROMPT SCRAP

Wastes that are recycled for direct reuse without entering the solid waste stream.

QUASI-PUBLIC LAND

This is land owned by tax-exempt organizations such as churches and fraternal organizations. Such land includes church buildings and schools, cemeteries and such miscellaneous buildings as Elks lodges, etc.

REACH

A reach is a generally homogeneous segment of a river or stream. Often in water quality management typical measurements of water quality from any point in the reach are used as representative of the entire reach.

REFERENDUM

A referendum is a vote of the (simulated) population of a jurisdiction on some issue presented to the people by the Politician. Most usually referenda are called to approve (or reject) a general obligation bond issue or a request for special millage, although they may be called to approve some legislative matter, such as open housing.

REFUSE

A term applied broadly to mixed solid waste including food waste, trash, street sweepings, and non-toxic solid industrial wastes.

REZONING APPLICATION FEE

The rezoning application fee is a charge of $100, which is assessed for each rezoning request submitted by a Developer or Industrialist. It is included in that player's financial statement for the next cycle.

RINGELMANN NUMBER

The Ringelmann Number is a scale for measuring the blackness of smoke fumes and is equivalent to the opacity. Ringelmann Numbers and opacities are used for specifying allowable smoke emissions (Ringelmann for black and opacity for other colors). #0 = zero opacity #1 = 20%, #2 = 40%, #3 = 60%, #4 = 80%, #5 = 100%. In APEX County, all smoke readings are reported as Ringelmann Numbers.

SALVAGE

The recovery for reuse of any valuable component from the solid waste stream.

SANITARY LANDFILL

An operation where solid waste is deposited in the ground in a controlled manner. The waste is compacted when delivered and covered daily. APEX County can have three classes of sanitary land fills. (See below.)

SANITARY LANDFILL--Class I

A site where disposal of toxic or hazardous industrial waste (solid waste type 1) is permitted due to the geology and soil characteristics. Solid waste type 2 and 3 may be deposited in this class site.

SANITARY LANDFILL--Class II

A site where only non-toxic or non-hazardous waste may be deposited. These sites receive primarily mixed municipal refuse (solid waste type 2). Solid waste type 3 may also be deposited in this class site.

SANITARY LANDFILL--Class III

A site where only solid fill (solid waste type 3) may be deposited.

SEWAGE TREATMENT LEVELS

Primary Treatment - A series of mechanical treatment processes including screening and sedimentation, which removes most of the floations and suspended solids found in sewage, but which have a limited effect on colloidal and dissolved material.

Secondary Treatment - A series of biochemical, chemical, and/or mechanical processes which remove, oxidize or stabilize nonsetteable, colloidal, and dissolved organic matter following primary treatment.

Tertiary Treatment - Any sewage treatment process that has the capability to remove over ninty-nine percent of the pollutants in sewage if it follows secondary treatment.

SOIL PERMEABILITY

A measurement of the water porosity of soil; soil porosity measured in gallons per day of water which will be absorbed by one square foot of soil surface.

SOIL SURVEY

An engineering/geological survey of an analysis area which provides data on the water table level, soil type, and soil permeability. These parameters are important criteria to determine the suitability of an A.A. for Class I, II, or III sanitary land fills.

SOIL TYPE

Three predominent soil types are found in APEX County--clay, sand or gravel.

SOLID WASTE

Any waste that can be handled as a solid rather than a liquid.

SOLID WASTE DISPOSAL

The end point of solid waste handling; may include open dumps, sanitary land fills, incinerators, composting, hauling out of APEX County by contract, salvage and recycle, etc.

SOLID WASTE SOURCES

Solid wastes are generated from various sources as --

Household - Solid wastes from residences.

Commercial - Solid wastes derived from non-industrial commercial operation.

Industrial - Wastes produced as a result of manufacturing or related industrial operation.

Municipal - Mixed Household and Commercial waste that may contain some street cleaning wastes and industrial solid wastes.

Agricultural - Wastes derived from basic crop or animal operation including waste vegetables, minerals and animal manure.

SOLID WASTE TYPE

APEX County solid wastes are specified as one of three following types--

S.W. Type 1 - Hazardous Wastes; includes sewage sludge, pesticides, industrial chemicals, etc., (Only small quantities of high toxic wastes and radioactive wastes are generated in APEX County and these are not included in Type 1 wastes.)

S.W. Type 2 - Household/Commercial Refuse; includes trash, rubbish, garbage and decomposable organic refuse from commercial and household operations picked up by regular route collection.

S.W. Type 3 - Solid Fill; includes bulky non-water soluable, non-decomposable inert solids from municipal and industrial operations, demolition, etc. Examples are earth, rock, gravel, concrete, asphalt paving fragments, clay, glass, and rubber products.

Industrial wastes are distributed among the above three categories depending upon the characteristics of the particular waste.

SOURCE TYPES (AIR POLLUTION)

Point Source - A stationary source of pollution which has the potential of emitting a substantial amount of pollutant(s) such as a factory or power plant.

Line Source - A moving source of pollutants such as automobiles, buses, trains, and aircraft.

Area Sources - The sum of numerous widespread small stationary pollution sources as the space heaters in buildings.

Indirect or Complex Source - Stationary facilities or developments which indirectly generate substantial pollution by means of activity associated with them (such as vehicle traffic generated by shopping centers, sports complexes, airports, etc.)

STANDARDS OF PERFORMANCE

Direct limitations of pollutant emissions from certain types of high pollution sources (power plants, etc.) set by EPA and/or the states.

STATE EQUALIZED VALUE

State equalization is a process designed to even out differences in assessment practices among political jurisdictions. The state equalization factor applied to each jurisdiction's assessed value may thus be different. The state equalized value for a jurisdiction, reached by applying the factor to local assessed value, is the base on which millage is levied to generate property tax revenues.

STINKELMANN NUMBER

The Stinkelmann Number is a scale (developed in APEX County) for measuring odor emissions, and for specifying maximum allowable odor emissions. Numbers range from 0-5, covering least to worst odor levels, respectively.

TAX RATE

See MILLAGE

TRANSFER STATION

Site at which wastes are transferred from small compacter vehicles to larger long distance transport vehicles.

TRASH

The non-food, non-putrescible fraction of solid waste.

UNIT COSTS

The costs to the Industrialist of operating his plant are calculated, for each production component, except labor, on the basis of the amount and cost of each component required to produce one unit of the product. These unit costs apply to fuel, administrative overhead, inventory, and raw materials.

Fuel Cost applies to the fuel required to produce each Industrialist's product and will be different for each fuel type.

General Administrative Costs include all overhead expenditures, other than salaries, involved in production.

Inventory Carrying Costs must be paid to store product inventory from one cycle to the next. This cost excludes taxes on inventory.

Materials Costs include all raw materials required to produce the product, except fuel.

The unit costs for each of these components which are applicable for a particular Industrialist for the next year are included in that player's output.

UNIT SALES PRICE

This is the price, which an Industrialist sets each cycle, at which he will sell a unit of his product. Each Industrialist except the power plant has complete control over price; although the number of units he actually sells

will be dependent on the relationship of his price to supply-demand conditions in the general market, and to the current average industry-wide price (reported for the last three years in the Industrialist's output).

WATER QUALITY SAMPLES

A water quality sample is a water sample and analysis providing data on seven water pollutant parameters. The water quality manager may order water samples and designate the location from which they are to be taken.

WATER TABLE LEVEL

The distance from the surface of the ground to the underlying ground water level.

ZONING CATEGORY

Zoning categories apply only to vacant land for APEX County. Each of the six zoning categories may be developed into one or more types of land use:

| FROM | TO |
|---|---|
| Zoning Category | Developed Land use Type(s) |
| (1) R - Single-family residential | (1) R-1 (low density, high cost)<br>(2) R-2 (med. density, med. cost)<br>(3) R-3 (high density, low cost) |
| (2) M - Multiple-family residential | (4) M-1 (low density, high cost)<br>(5) M-2 (med. density, low cost) |
| (3) C - Commercial | (6) CL (Commercial-Local)<br>(7) CR (Commercial-Regional) |
| (4) I - Industrial | (8) IL (Local industry)<br>(9) IX (Exogenous industry) |
| (5) O - Office | (10) O (Exogenous office) |
| (6) A - Agricultural | (11) A (Active farming) |

# CHAPTER 3

## Chapter 3

## RESPONSIBILITIES OF THE GAME DIRECTOR

The successful application of METRO-APEX is heavily dependent on a skillful presentation by the Game Director and his assistants. Not all audiences respond to gaming-simulation in the same way nor do all audiences enjoy-- or even expect-- the same type of rewards. Therefore, the Game Director and his team must exercise control over the run to insure that the needs of the participants are met effectively. This chapter of the operator's kit describes the responsibilities of the operator and his team in launching a run of METRO-APEX.

### OBJECTIVES OF METRO-APEX

A. What METRO-APEX can do:

1. teach about the interactions of the urban system
2. encourage an interdisciplinary approach to decision-making
3. serve as a communications tool
4. provide a "realistic" environment for experimenting with alternative strategies
5. provide "realistic" feedback on players' decisions
6. condense the time needed to accumulate experience
7. motivate-instill the "need to know"
8. involve participants
9. provide a medium for the application of theory
10. integrate learning
11. expose participants to different perspectives
12. teach about time pressures
13. teach about specific subjects such as how to prepare a budget, how to set up an air quality monitoring network, etc.

B. What METRO-APEX does not do:

1. teach about computers

2. predict real world developments in terms of quantitative data

The Operating Team

Before describing the sequence of activities under the control of the Game Director, it is necessary to describe the desired set of skills for a team running METRO-APEX. Under certain conditions, it is possible for a single Game Director to run the game (however, he will no doubt yearn for roller skates and some extra arms). The functions that must be performed by a single Director or a team include the initial presentation of the game, the administering of assistance to the various role players, the pseudo-role playing of key characters not otherwise represented in the simulation, the computer processing, and the handling of critique and review. Under ideal circumstances, the general presentation falls under the control of a single individual (the Game Director), the assisting of players during the game is handled by the role advisors, the computer processing is the responsibility of yet another member of the team (the technical advisor or computer operator), and any or all of the staff can function in a pseudo-role playing capacity.

Doubling up on tasks is most easily accomplished by combining the tasks of the general Game Director with those of one role advisor and assigning responsibility for the computer processing to another (or the same) role advisor. Beyond that, more than one role may be served by a single advisor; for example, the planners and the politician might be advised by a single individual. Whatever the assignment of specific tasks, each team must be capable of managing the run, advising each of the roles and processing the decisions through the computer.

Activities of the Game Overall Director (GOD)

1. Pre-Game Activities. A certain amount of pre-game preparation can go a long way toward insuring a smooth and effective run. The game operator must be sure that a 360 series or other appropriate computer is readily accessible. Multiple-ply paper or other means of supplying duplicate copies of printout should be available as well as computer cards.

Arrangements for space and furniture should be made prior to the run. Experience thus far indicates that the physical conddtions of the game are among the more crucial variables under the control of the operator for in-

suring a successful run. Additional discussion of these logistics appears in Chapter 4.

If the audience is coming from out of town or from a great distance, arrangements for food and shelter should be carefully worked out in advance. These arrangements may seem trivial or unimportant, but considerable energies can be diverted from a run if participants are concerned with personal needs. If food is to be provided during the run, arrangements should be made ahead of time. (It is usually desirable to have a coffee pot "bubbling" through a run.)

The Game Overall Director should pick his advisors in advance and guarantee their continued presence and ability to perform their tasks. A pre-game meeting of advisors is practically essential to establish objectives for the particular run and plan appropriate intervention strategies.

Finally, and if possible, introductory materials should be distributed to participants in advance of the introduction. If the game is being demonstrated, one would not expect that participants will read all of the pre-game materials or, if they do, one should not expect a great deal of learning via this technique. However, under normal operating conditions complaints about inadequate preparation seem to crop up whether the introduction takes 5 minutes or 5 hours; the advance distribution of materials should help minimize these.

2. Opening Remarks. The Game Director must make an opening presentation to the players. Obviously, this will vary in style with the audience and with the personality of the Director. Here again, experience provides us with some useful clues. A short opening seems to accomplish everything that a long one does with the exception of boring the players. Thirty well spent minutes describing the nature of gaming-simulation, the background of the simulated city and a cursory introduction to each of the roles is usually adequate. The information needed to prepare such a statement is contained in various chapters of this manual.

3. Role Advising. After the introduction, it is useful to give all the players in a particular role extensive background in this role. This is usually done by breaking the audience into groups and assigning a role advisor to each group. The mode of role advising is also a personalized thing and should vary with the audience. Clearly, lay participants or students need a different type of introduction than professional specialists.

As a general guideline, the role advisor should probably give a brief description of the nature of the role in the "real world." Subsequently, that description can be abstracted to the METRO-APEX situation; that is,

the scope of the role in the game can be defined. Once the role is understood (even if that understanding is only partial), the advisor can explain to the players the specifics of the worksheets and the details of the output. Finally, the role advisor can, if need be, suggest strategies and objectives to the players, trying to give them a perspective and context with which to begin.

At the conclusion of this introduction (which often takes about two hours), most new players are confused and overloaded with information. It is usually helpful if they are reassured that this is normal and will soon be relieved after a cycle or so of play. Fortunately, the play of the game tends to overcome the frustration in one or two cycles; therefore, the exercise ends on a more pleasing and more confident note.

4. The Play-- Routine. On the mechanical side of the operation, the advisors and the Game Director must make sure that worksheets are distributed correctly and filled out properly. The distribution of the computer printout also falls to the operating team. General room maintenance, the posting of summary information, direction to the resource materials, etc., also occupy the operating team during a run. During the actual play of the game, members of the operating team serve as consultants to the players. Many of the issues and discussions that arise during a normal run of the game are not documented sufficiently in the program and/or the support literature to allow players to engage in more than an initial attempt to resolve the problems. Because time for researching such problems is often not available, the operating team must supply the missing information as best as it may be able, concentrating on conditions which are felt to apply in most situations. The operating team must supply the needed input as the situation arises. It might prove useful for a Game Director to record those requests that arise repeatedly, research the problems alluded to in those requests, and prepare responses in anticipation of additional requests for the same information in subsequent runs. Whatever the source of the information, it is imperative that the full operating team be informed of its content.

Perhaps the most important function for the operating team is the periodic critique. A great many activities go on simultaneously during a run of METRO-APEX and, often, all the players are unaware of the overall pattern of events as they unfold. The Game Director must be sensitive to the needs of his audience for occasional discussion of this larger context. Furthermore, a large part of the learning experience for the participants is the discussion of their strategies, attitudes and perceptions-- playing is not the only beneficial educational activity.

5. The Play-- Extraordinary. Quite often situations arise that call for the unusual. The game is only the skeleton of a complex urban structure and often the operating team is called upon to temporarily sup-

plement that skeleton by assuming the role of persons not otherwise represented. The Game Director and his crew should be sensitive to the players' need for such support and should be ready to respond. Particular types of intervention are described in greater depth in Chapter 6.

Sometimes these unusual situations do not arise, but for purposes of explication, demonstration, or even entertainment, their appearance could be facilitated. Here the Game Overall Director and his team should be creative and improvise to construct an unusual event. For example, "GOD" might choose to jar the system with a pollution crisis, new industry, large grant of money or threats from the ghetto. It is this creative aspect of operating the game that generates the most fun and excitement for the players and the staff, in addition to providing the richest learning and/or communication environment. Whether the intervention is a response to players' needs or initiated by the operating team, it is imperative that all members of the operating team be aware of the boundaries and dimensions of the strategy. Some standard modifications or interventions are described in Chapters 6 and 8.

6. Post-Game Activities. After each cycle, GOD and his crew must prepare for and execute the computer processing component of the game. Of greatest importance is the validation of the decisions. In appropriate situations, the role advisors can actually fill out the worksheets with the players-- in this instance, they should be correct. More often, the players will fill out the worksheets. These should be checked carefully for consistency and completeness by the role advisors before the players leave the premises. Such careful checking saves enormous wear and tear on the staff during the computer processing. The role advisors should transfer the decisions as reported on the worksheets to the keypunch coding forms carefully and accurately.

The computer processing itself is described in detail in the Computer Operator's Manual and therefore, will not be discussed here. However, it is the Game Director's responsibility to see that the computer processing is done correctly and on time.

7. Critique. To reinforce the comments in the section dealing with routine, situations will no doubt arise that are of extreme value from an educational or communications standpoint. At these times, GOD may choose to stop the role playing and discuss the unusual events. Although much learning is derived from the play of the game, occasional review of the proceedings crystallizes key issues and allows all players to derive benefit from a particular event.

At the conclusion of a run it is imperative that players discuss their perceptions of what went on to reinforce and clarify knowledge gained earlier. Therefore, the Game Director should lead a critique of the play at the game's conclusion. One strategy is to announce that there will be one more cycle

than the number actually played. This minimizes "end of game strategy" on the part of the players. The time reserved for the extra cycle can then be spent in critique. Critiques will vary with each run and should draw attention to those experiences most related to the goals of the group.

Comments on Timing

The Game Director is responsible for the timing of a given run. Commonly, each cycle takes about four hours (though a full eight hoursday may be spent on a single cycle) and most runs cover about five cycles. Although the constraints on the audience often dictate the time for a run, the operator should insist on at least three cycles of play and cycle time of at least three hours. If such time cannot be spent on a run, METRO-APEX is probably the wrong gaming-simulation for the audience.

Within a cycle, GOD controls the timing. Typically, cycles are marked with periods of intense interaction or surprising calm. These variations are not unusual and should not concern the director. Occasionally, GOD may choose to end the calm with some form of intervention, as for example the illustration of some key point or concept.

GOD is responsible for seeing that decision forms are completed by some appointed hour. Here prodding by the Director and his crew is needed to push the players into decisions. This is a part of the simulation--most key decisions in urban areas are made with incomplete information and insufficient time. It is particularly important to assist those players who are having difficulty in coping with the pressures and complexities of their role in the early cycles. Failure by a single role player to make a coherent set of decisions may be harmful to the overall run but, more important, it may be disastrous for the player-- often leading to his "copping out." This is a point where the potential for learning exists for the student. He can, with the proper assistance, begin to put the causes of real world success and failure in perspective. Through this new insight he can add to the game and the experiences of the other players.

## ROLE OF GAME OVERALL DIRECTOR

A. To Coordinate Pre-game Planning

1. Consider objectives of a run and make sure METRO-APEX is the right tool.

2. Meet with game team (role advisors, computer operator, keypunch operator...) to plan for the run and assign staff responsibilities.

3. Make role assignments
   a. decide what roles to play and what to suppress
   b. establish desired number of players for each role
   c. establish policy for role assignment (by choice, by random selection...)
   d. assign non-gamed roles (judge, state and Federal government, Public Utilities Commission, news media, pressure groups...)

4. Establish any special conditions for the run
   a. set initial conditions in the computer
   b. write headlines for the newspaper
   c. plan an initial T.V. newsbroadcast (closed circuit video tape equipment)
   d. decide on background legislation for the run
   e. clarify rules for the run (what constitutes a public hearing, whether land transactions must go through developers, how to deal with simulated industries...)

5. Finalize schedule for the run
   a. decide on time for general introduction and role introductions
   b. decide on number and length of cycles
   c. decide on number and length of STEPs
   d. establish election schedule
   e. decide on time for critique

6. Finalize computer arrangements for the run
   a. arrange for the use of a key punch
   b. check supply of computer paper (multiple-ply if available) and computer cards
   c. run project lists and cycle 1 printout (with appropriate number of copies)
   d. IBM 360 arrangements
      1. check JCL cards
      2. make sure data sets are allocated on a disk
      3. see about changes in priority

7. Finalize other logistics
   a. reserve a room (or rooms) for playing the game
   b. make food and lodging arrangements
   c. arrange for refreshments during the run
   d. arrange for xerox or copying facilities during the run
   e. arrange for the use of a calculator or adding machine during the run
   f. arrange for the use of closed circuit video taping facilities during the run

8. Plan STEP Exercises
   a. Write a description of each exercise
   b. assign participants to special roles in the STEP (if necessary)

c. arrange for "experts" to critique and evaluate STEP
d. set up closed circuit video tape equipment to record the STEP (if desired)
e. collect appropriate reference material

9. Send out preliminary materials to game participants
   a. include a time schedule for the run
   b. indicate the location of the run, parking and eating facilities (include a map, if necessary)
   c. indicate the role they will play and send appropriate role manuals
   d. send general METRO-APEX literature (brochures, reprints about the game, etc.)

10. Set up game room with all necessary materials
    a. arrange furniture
    b. post wall charts and maps
    c. distribute role manuals (if not previously done), reference manuals, cycle 1 printout, worksheets, and name tags
    d. distribute other supplies (grease pencils, paper, chalk, tape, thumbtacks...)

11. Set up closed circuit video tape equipment

B. To Oversee Actual Game Play

1. Introduce the game
   a. discuss the nature of gaming simulation in general, and the goals and objectives of the run
   b. briefly review the major roles and the community of APEX County
   c. review the schedule, the STEPs, and any logistics

2. Set the pace of the game
   a. establish beginning and end of cycles
   b. encourage mini-STEPs
   c. decide when to have news broadcasts
   d. decide when to break for critique

3. Coordinate role advisors

4. Arbitrate when conflicts arise

5. Modify the game as needed
   a. assume simulated roles
   b. add crises
   c. hold special meetings, hearings, court trials...

6. Collect and tally elite opinion poll votes

7. Collect news items

C. To Oversee Computer Operations

1. Complete "Instructions to Computer Operator"
   a. decide on changes in project list, etc.
   b. decide on use of computer options

2. Check that role advisors code appropriate worksheets

3. Code miscellaneous forms
   a. issue decisions
   b. candidate election model information
   c. newspaper inputs

4. Check that computer cards are punched and proofed

5. Read and analyze computer printout in preparation for subsequent game cycles

6. Keep list of computer "Bugs" (see D-3)

D. To Coordinate Post-game Activities

1. Moderate critique of the game
   a. have role advisors critique the performance of the roles they have worked with
   b. have participants explain their objectives and the strategies they used to meet them
   c. draw generalization from group performance in the game
   d. relate game experience to "real world" activity
   e. relate game experience to course analysis

2. Analyze results of METRO-APEX questionnaires

3. Document any computer "bugs" and suggestions for computer modifications and revisions

4. Prepare an evaluation of the METRO-APEX run in general
   a. discuss whether stated objectives were met
   b. discuss training implications of the run
   c. suggest modifications and revisions

## ROLE OF ROLE ADVISOR

A. To Introduce the Role

1. Discuss objectives of the role
2. Suggest strategies to meet these objectives (in real world and in APEX County)
3. Explain computer printout
4. Stress the interaciton with other roles
5. Introduce the resources and background information available to the role
6. Explain the organization of the worksheet and the basic information needed on it

B. To Help During the Cycle

1. Collect news articles
2. Provide reference material as needed
3. Assume simulated roles as needed
4. Implement meetings, etc.
5. Advise on filling out worksheet
6. Instigate mini-STEP
7. Coordinate "on the spot" decisions with Game Director

C. To Help with Computer Processing

1. Look over worksheets before players leave
2. Transfer decisions on worksheets to keypunch sheets
3. Suggest use of computer options to Game Director (i.e. force in exofirms, change background pollution, etc.)

D. To Help with STEPs

1. Coordinate STEP preparation for the role

2. Provide special reference material

3. Assume extra roles (such as angry citizen)

E. To Critique and Evaluate Player Performance

1. Provide feedback on individual and group performance

2. Relate game performance to "real world" activity

3. Draw generalizations, if possible (and if appropriate)

F. To Evaluate METRO-APEX in General

1. Document any computer "bugs" that appear during cycle

2. Suggest computer modifications

3. Suggest manual and worksheet revisions

# CHAPTER 4

Chapter 4

# LOGISTICS

## Timing

The last chapter included a brief section dealing with the timing of a run. Specifically, it was stated that each run of the game should consist of at least three cycles (simulated years), the optimum number being five. Each cycle should span at least a three hour period, although a longer cycle is within reason. Within these guidelines, the style of play can be varied considerably by using different schedules for the play.

The most obvious constraint on the scheduling of a run is the availability of the participants. The more subtle constraint is the goal and aim of the participants in playing the game. Play can range between the intensive-- two cycles per day for two or more days-- and the extensive-- one cycle per week for five or more weeks. Short intensive sessions may allow only cursory treatment of certain problems and can be exhausting for players and the operating team if not carefully scheduled. Nevertheless, such sessions are usually quite spirited, provide a good exposure to the game and its models, and require a relatively short time commitment from the audience. In contrast, longer extensive sessions are conducive for deeper exploration of the issues and problems presented by the game; allow for in depth probing of the strategies of the players and the nature of the processes in the simulation, and take on a more leisurely pace for both player and operating team. However, such sessions are often characterized by waning interest on the part of participants because of the long delay between cycles, and they also require that the audience be available for several weeks.

The experience with the exercise thus far indicates that one cycle per day for five days is the most preferred scheduling arrangement. The balance between the difficulty of maintaining momentum and the need for in depth exploration of the nuances of the simulation is best kept within this range. Clearly, if the needs of the audience are best met by a detailed study of the system with a great deal of attention given to the raft of possible supplementary activities, the cycles should run longer and be spread out over time. However, if the audience needs only a cursory look at the system, shorter cycles over less real time are adequate.

An additional hindrance to rapid cycling is the interim period that must be reserved for processing. For the IBM 360-50 and higher series computers, processing may be as short as one hour. The time from worksheets completed, their coding, keypunching, proofing and processing may take from one hour to five hours depending on staff experience and processing facility operations. An attempt to conduct multiple cycles in a single day must take into account the processing time involved. The STEP Exercises (see Chapter 7) are often

conducted for the participants while the processing is taking place. However, in runs over a longer period of time, the STEP Exercises can be inserted at the discretion of GOD.

A sample schedule is:

WEDNESDAY

| | |
|---|---|
| 3:00 - 5:00 | Introduction to METRO-APEX |

THURSDAY

| | |
|---|---|
| 8:30 - 12:30 | Cycle 2 |
| 1:30 - 4:30 | STEP (staff processing) |
| 4:30 - | Return output |

FRIDAY

| | |
|---|---|
| 8:30 - 12:30 | Cycle 3 |
| 1:30 - 4:30 | STEP (staff processing) |
| 4:30 - | Return output |

MONDAY

| | |
|---|---|
| 8:30 - 12:30 | Cycle 4 |
| 1:30 - 4:30 | STEP (staff processing) |
| 4:30 - | Return output |

TUESDAY

| | |
|---|---|
| 8:30 - 12:30 | Cycle 5 |
| 1:30 - 4:30 | STEP (staff processing) |
| 4:30 - | Return output |

Room Arrangements

The physical layout of the room is an important determinant of the probability of success for a given run. The room must be large enough to accommodate the players easily and comfortably. (A four hour period spent in an uncomfortable, cramped, smoke-filled room is a strong deterrent to an enthusiastic second four hours). The room should have blackboards or an area for a portable blackboard. The furniture should be portable and relatively comfortable. Tables should be large enough to allow a reasonable amount of spreading out of materials by the players. The room should have adequate free wall space for the display references.

If more than one room is available for a given sun, the flexibility of the room arrangements increases dramatically. Adjoining rooms can be used for public hearings, court trials, board meetings, etc. If closed circuit video tape equipment is available, an adjoining room can be used as a T.V. studio. A cardinal rule, however, is that all cycle play take place with all participants available to other players. If participants disappear during transactions, continuity is lost and player frustration can become damaging to the game.

The interaction pattern that emerges during the game is usually highly dependent on the placement of players within the room. Proximity breeds coalition. Individuals usually contact other players in those roles located near their own position first. Players in the center of activity often are involved in most of the interaction. Therefore, room arrangement can isolate or emphasize a particular role. Several suggested room layouts are illustrated in the following diagrams.

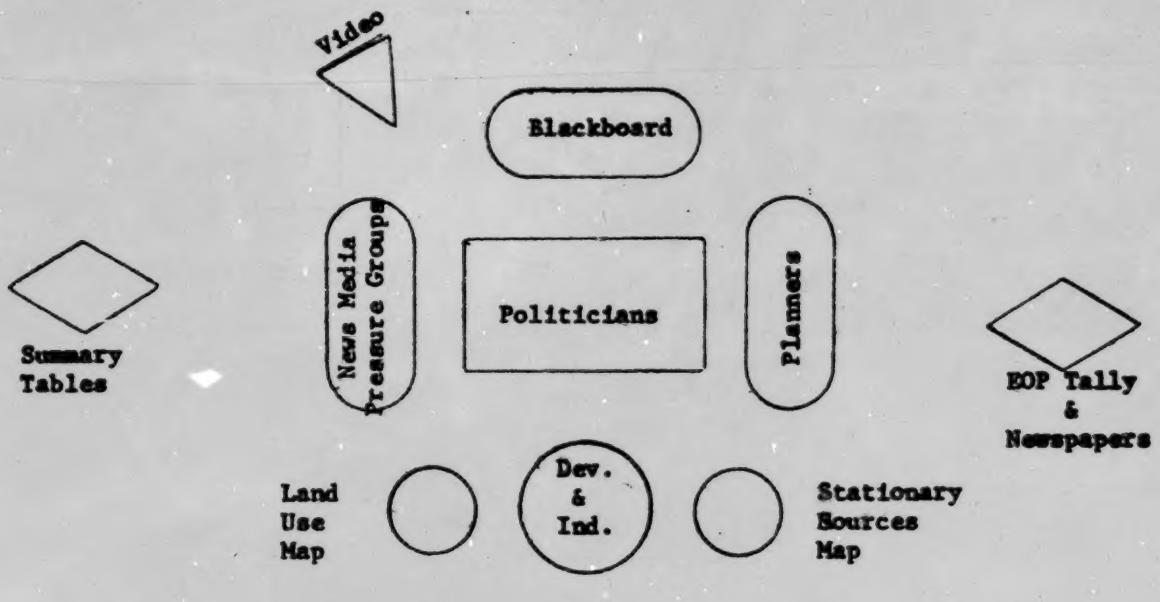



Figure 1: Emphasis on a single role— Concentration of persons in the same roles

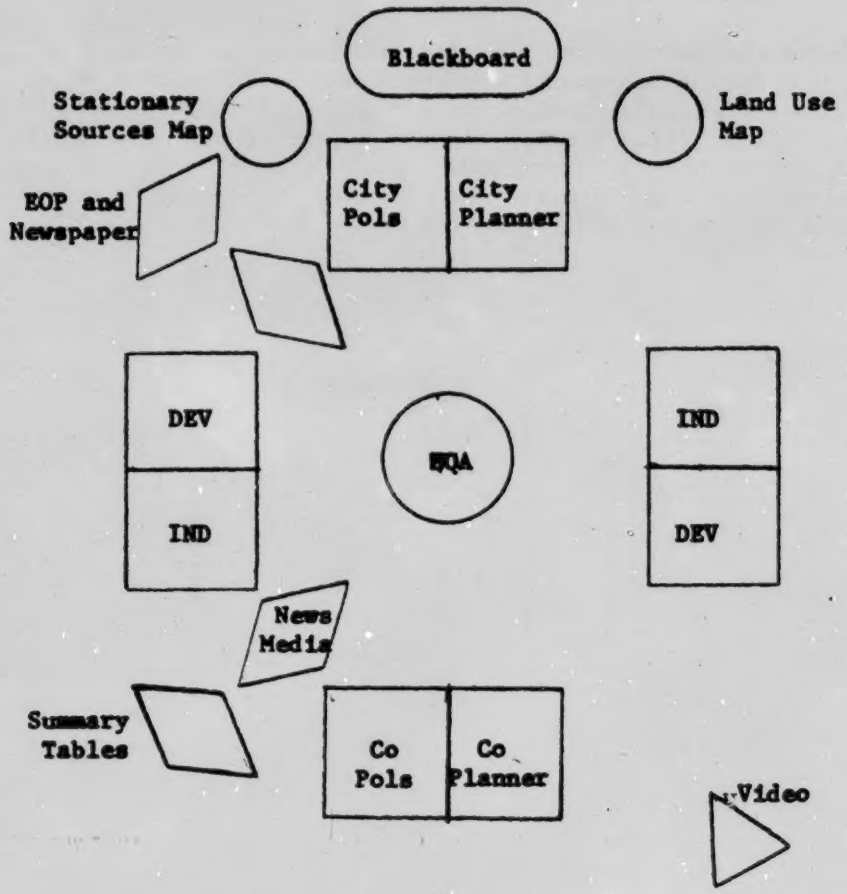



Figure 2: Emphasis on a single role— Dispersion of persons in the same role

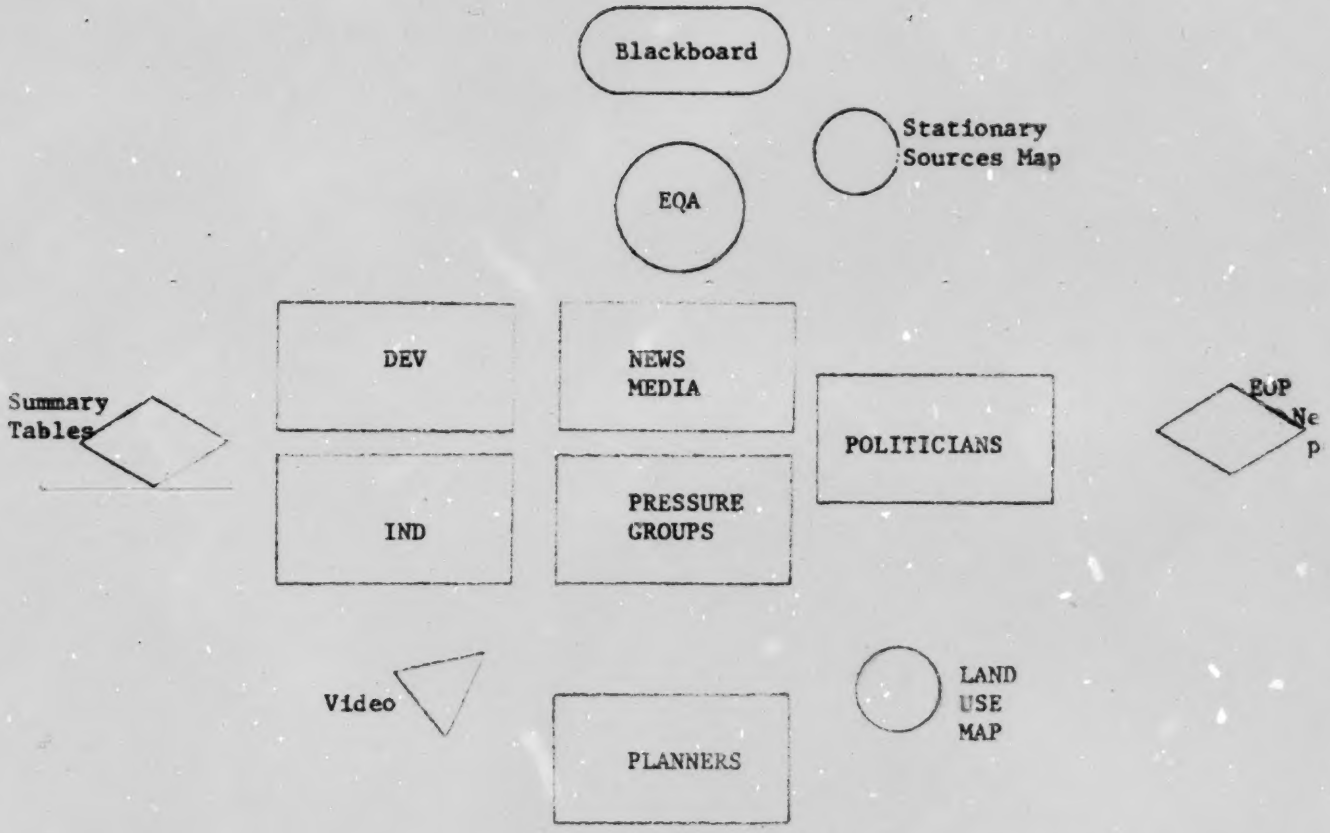



Figure 3: No special Emphasis-- Concentration of persons in the same role

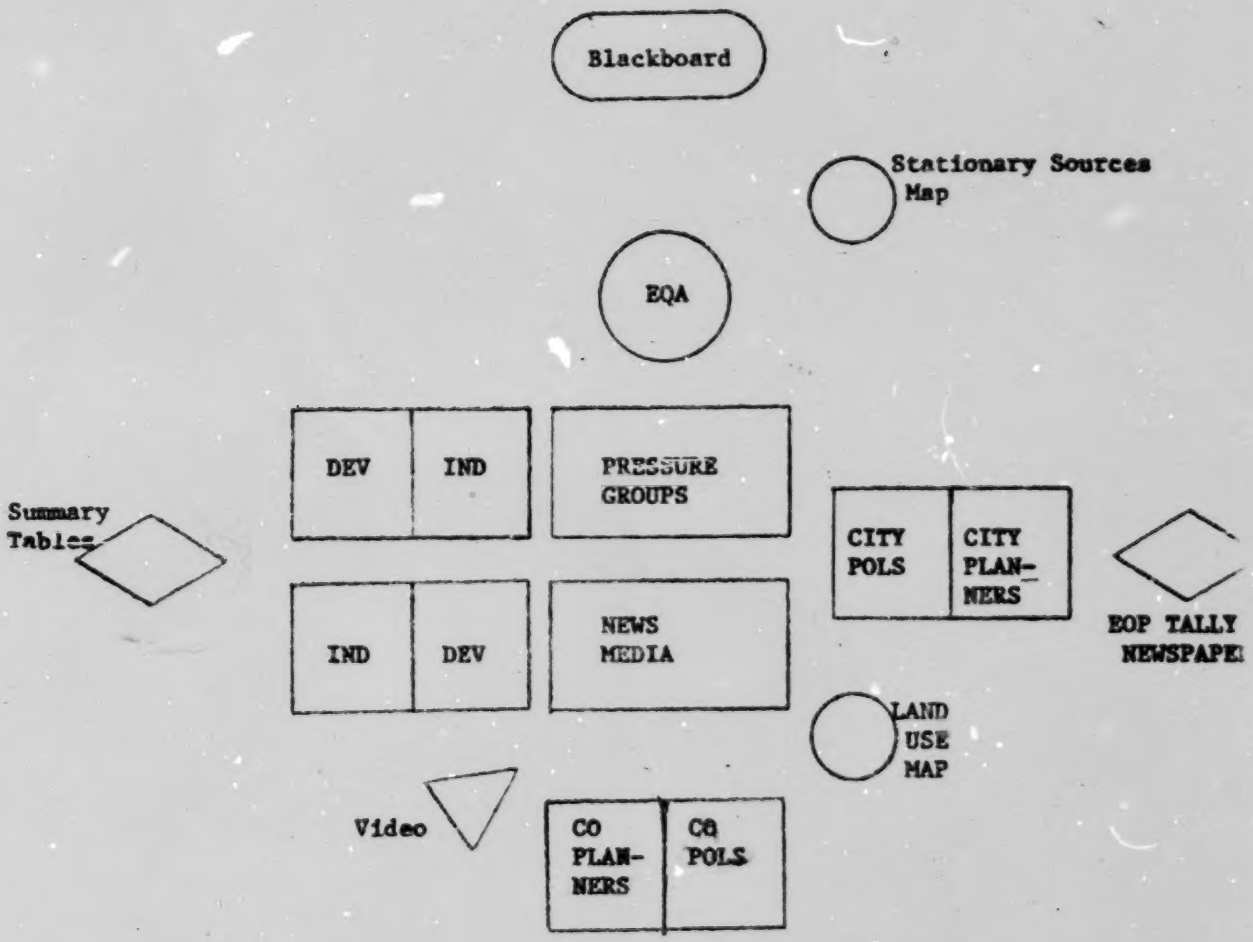



Figure 4: No special emphasis— Dispersion of persons in the same role.

## Display Materials

Several kinds of support materials for the players should be posted in clear sight. In general, it is good practice to place most materials in reasonable proximity to the role most likely to use them. This philosophy was reflected in the sample room arrangements.

Player support materials include: 1) Land Use Map, 2) Summary Tables (printout from the computer), 3) Elite Opinion Poll Tally Sheet, 4) One copy of the newspaper, 5) Other maps as available. Optional items inlcude a rezoning record and a summary of the preceding cycle's decisions on issues.

## Role Assignments

The METRO-APEX gaming-simulation has been used effectively by as few as 17 or as many as 100 players. Gaming with very large groups, however, should probably not be attempted without a thoroughly experienced Director and staff. Optimum game size, with a seasoned Director, is probably from 30 to 60 players, but this is strongly dependent on the roles played, make-up of the players and the specific objectives of the simulation. The role assignments can be made in any one of several ways. Persons can be assigned roles by random draw. A first come first serve philosophy can be applied. Persons can be asked for preference and assigned to maximize the number of persons in their first or second choice. Finally, arbitrary assignment can be made by the Game Overall Director. The rationale of this latter approach is up to GOD. Whatever system is used, it is important not to let pre-existing "cliques" band together during the run. In the past, roles have been assigned: to match real world avocation to gamed role; to place people in the least (rather than most) familiar role; and to match persons to the role in which they might learn the most, given their backgrounds.

The number of persons assigned to each role is a function of the total number of players. There should usually be more County Politicians than City Politicians and more Industrialists than Environmental Quality Agency Personnel. It is usually advantageous to have an odd number of decision makers in such roles as City and County Politicians. Also, the election model will allow for the election of representatives for 3 city constituencies (Ward 1, 2, 3) and 5 county parts (Sub, Township 1, Township 2, Co. at large, CC at large). An attempt is usually made to keep some balance between the representatives of the public and private sectors. The following chart summarizes suggested role assignments for groups of different sizes.

| Size of Group | POLITICIANS* City | City Manager | Co.* | Co. CAO | PLANNERS* City* | Co.* | Trans. or Regional (1) |
|---|---|---|---|---|---|---|---|
| 17 | 3 | | 4 | | | | 3 |
| 20 | 3 | | 4 | | | | 3 |
| 30 | 3 | | 5 | | 2 | 3 | |
| 40 | 3 | 1 | 5 | 1 | 3 | 3 | |
| 50 | 3 | 1 | 5 | 1 | 3 | 5 | |
| 60 | 3 | 2 | 5 | 2 | 3 | 5 | 2 |
| 80 | 6 | 2 | 10 | 2 | 5 | 7 | 2 |
| 90 | 6 | 2 | 10 | 2 | 5 | 7 | 2 |

| Size of Group | EQA* OFFICE EQA* | APCO | WQM | SWM | DEVELOPERS* 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 17 | 2 | | | | | | 1 | | | | |
| 20 | 1 | 2 | | | | | 1 | | | | |
| 30 | 1 | 2 | 1 | | 1 | | 1 | | | | |
| 40 | 1 | 2 | 1 | 1 | 1 | | 1 | | | 1 | |
| 50 | 2 | 3 | 2 | 1 | 1 | | 1 | 1 | | 1 | |
| 60 | 2 | 4 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 80 | 3 | 4 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 2 | 1 |
| 90 | 3 | 4 | 3 | 3 | 1 | 1 | 2 | 1 | 1 | 2 | 1 |

| Size of Group | INDUSTRIALISTS* 1 | 2 | 3 | 4 | 5 | 6 | 7 | NEWS MEDIA | PRESSURE GROUPS |
|---|---|---|---|---|---|---|---|---|---|
| 17 | 1 | 1 | 1 | | | | | | |
| 20 | 1 | 1 | 1 | | | | | | 2 |
| 30 | 1 | 1 | 1 | 1 | 1 | | | 2 | 3 |
| 40 | 1 | 1 | 1 | | 1 | 1 | 1 | 3 | 6 |
| 50 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 4 | 8 |
| 60 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 4 | 12 |
| 80 | 2 | 1 | 2 | 1 | 2 | 1 | 1 | 5 | 12 |
| 90 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 5 | 18 |

* Suggested minimum roles. Other roles may be utilized as desired to stress certain objectives and/or with larger groups of participants.

(1) Additional special planning boards or specialized public planning agencies may be added or city and county planning boards combined. This board may be structured to stress specific issues such as transportation, comprehensive long-range planning, health planning, etc.

Closed Circuit Video Tape Equipment

The use of closed circuit video tape equipment can add greatly to the quality of the game. The video taping of STEP Exercises, news broadcasts, and editorials and campaign speeches adds a new dimension to the activity of the game. GOD can announce special grants or simulate some crisis situation. Through the use of closed circuit video tape equipment, the participants often feel that they are active participants in the community. The imagination and creativity of the participants with this medium will often compare favorably with professional broadcast television programming.

# CHAPTER 5

## Chapter 5

## DESCRIPTION OF COMPUTER MODELS

A detailed description of the computerized component of METRO-APEX is beyond the scope of a kit of this type. At best, a sense of the nature of the basic simulations making up the system can be conveyed in this document.

In anticipation of the types of questions that often come from a group unfamiliar with simulation, it is useful to preface the highly specialized descriptions of particular simulations with a few more general remarks. Computer simulation is a technique used by specialists to harness the speed of a computer for the purpose of reproducing sequences of events and decisions that model change processes in real-world situations. Simulations are normally based on theories of "how the world works" and, as such, are nothing more than abstractions of basic natural and social processes. The computerized form of abstraction in METRO-APEX condenses time and reduces the complexity of essential processes to manageable proportions.

In this exposition, it is useful to categorize simulations according to the degree of sophistication of the underlying theory. Models are simulations predicated on well formulated, logically consistent theories of actual, real-world processes. Algorithms are less sophisticated, makeshift procedures that produce the proper set of outputs but, possibly, with a less than fair representation of the underlying process. Clearly, this distinction is a matter of degree and, because the state of knowledge with respect to urban systems is so poor, many models prove to be nothing more than useful algorithms when subjected to close review.

It is also useful to identify two distinct types of simulation-- social and environmental system simulation. Simulations of social systems are based on theories of human behavior. These can be subdivided further into micro and macro simulations. In urban or economic theory jargon, simulation of individual behavior and/or decision making is micro-simulation. Macro-simulation is applied in situations calling for prediction of aggregate behavior patterns. In contrast to social simulation, environmental simulation is directed at describing the workings of natural or physical systems, particularly as those systems respond to stress from the social sector.

For the most part, micro-simulations are a part of the gamed component of METRO-APEX. The computerized simulations described in the remainder of this section are largely macro-simulations of aggregate behavior patterns or environmental simulations.

1. The T.O.M.M. Model. At the heart of the urban-spatial location process in METRO-APEX is the Time Oriented Metropolitan Model (T.O.M.M.). T.O.M.M. is used to generate the demand for urban space, both residential and commercial. A modification of the Lowry model, introducing the notion of marginal rather than total change in urban areas and the concept of household types, T.O.M.M. assumes that the initial configuration of basic industry is the primary driving force in determining the shape of the city. The number of households in the city reflects the ratio of households to employees of cities in the size range of Lansing, Michigan. Households are allocated in space so that the number of households in a given area is proportional to the potential of that area for households, where the potential of a particular area is a measure of the employment opportunities in all other areas weighted by their accessibility to that area. The availability of land also affects the allocation of households; areas with large quantities of vacant land zoned for residential use draw households. Types of households within areas are determined so as to reflect the initial distribution in space of the various household types as well as the capital expenditure pattern on schools and local infra-structure.

The number of employees in each commercial employment category (local industrial as well as regional and local commercial) is a direct function of the numbers of households, by type, in the city. Commercial employment is apportioned in space so that each analysis area is supplied with adequate service. Specifically, each area is assigned employment in each category proportional to the market demand (the sum of household and basic employment in all other areas divided by the accessibility from those areas to the given area) generated in that area.

The demand for urban residential space is determined in SELL (see the next paragraph) as a function of the number of households demanding space. The demand for commercial space is determined by assigning a quantity of land per employee in each area.

2. The SELL Algorithm. Given the demand for space generated by the T.O.M.M. model, the SELL algorithm introduces the effect of the supply side of the market. SELL matches the demand to the supply generated by game Developers. Because the supply created by decisions made in a run of the game is but a limited part of the total needed, the balance of the supply must be accounted for. Thus, the assumption is made that if space exists in an area where demand exceeds game-generated supply, the excess demand is met by the market. The SELL algorithm "cascades" demand from the most desired area to adjacent areas in the event that neither gamed nor market supply in the given area is sufficient to meet the demand in that area. Once the final demand in the area is determined, the space occupied by the housing units is calculated. SELL also adjusts the prices and values of land by calculating marginal adjustments according to the relative size of demand for space in an area compared to the overall demand.

3. The GROW Algorithm. The GROW algorithm is little more than a linear extrapolation of growth in the basic industrial sector. Subject to modification by incoming exofirms (new firms) or operator intervention, the growth of the basic sector in all areas is calculated as a straight percentage set according to the type of industry found in the area. Growth in gamed industry is added into the growth calculated by other means.

4. The Voter Response Model (VRM). Because a sophisticated statement of the local electoral process is glaringly absent in political science literature, the METRO-APEX formulation will be credited with the title "model," as no alternative concept has been presented and validated in the literature. One basic hypothesis underlying the model is that the rate of turnout has a critical effect on the election outcome because the composition of the voting public changes markedly as turnout rate changes. Thus, two components make up the VRM— turnout calculations and the subsequent determination of issue outcome.

The turnout for an election is calculated as a deviation from one of two norms, the norm in major election years (candidate election as well as issue election) or the norm in non-major election years. The deviation is a function of the quantity of dollars included in issues on the ballot, the quantity of campaign expenditures stirring up interest, and a random effect. The average turnout rate thus calculated is broken down by household type so that the higher the average turnout, the greater the proportion of lower class voters.

Given the turnout, the VRM determines the outcome of specific bond or millage issues. The support for a given issue is calculated by computing the deviaiton from typical average support rates. These rates vary by household type as well as issue type (basic or non-basic). The lower class households are generally assumed to be less supportive of higher taxes. The deviation from the typical rates is a function of the dollar size of the issue, the elite opinion poll on that issue, the campaign contributions for and against the particular millage or bond, the overall unemployment rate for the community (a proxy for general community satisfaction), and a random effect. The resulting support rates, by household type, are applied to the turnout rates by type with the final result taken as positive if the sum of the supporting voters across all types is greater than half of the total number of people voting.

5. The Candidate Election Model (CEM). The CEM is less than a perfect simulation of the local candidate election process. Because the time constraints in gaming are so severe (one year is condensed into a few hours), the model must be tailored to meet several constraining specifications and, therefore, cannot capture the full dynamic of local election campaigns. However, the abstraction of the process does include elements of a campaign

and, if used with imagination, can induce small-scale party-and/or organization politics.

There are four components to the CEM-- the "party support," the campaign, the performance of the incumbent and random effect. The party support mechanism is an operator option. In the normal election process of the game, the vote by the elite of the community (the participants in the game) simulates their public stand for or against the incumbent. The players' votes account for 60% of the outcome of the election; however, when no elite vote is held the "party support" is split equally between the candidates. If the Game Director chooses, the "party support" may be weighted to simulate community voting patterns that exist in the "real world."

The campaign component compares the relative positions of the candidates with the pressure groups and household types active in the electoral district. The candidate spends accrued campaign funds stressing his positions on the numerous newspaper issues. Scores are compiled for each candidate by comparing the issue outcomes, the pressure group and household type positions, and player's position, with weighting done according to the dollar expenditures on the numerous issues.

The incumbent performance component evaluates the status of the jurisdiction with respect to taxation rates, deficits or surpluses, capital plant program and operating expenditure pattern. The incumbent is rewarded according to his jurisdiction's successes or failures in these areas. Finally, a random factor is applied to the result.

In the event that no gamed player comes forth to challenge an incumbent, the CEM will supply, at the discretion of the operator, a simulated opponent with a well-defined political outlook. The simulated opponent takes stands on issues and allocates money stressing those positions in a fashion analogous to the gamed opponent.

6. The Air Model. The Air Model is made up of two distinct components. The first calculates the total emissions generated in each analysis area and the second converts those emission readings to air quality measurements via some statistical techniques developed by Dr. Ralph Larson.

The emission rate in each analysis area is the sum of all emissions from industrial point sources, automobile exhausts (line sources) and space heating. Industrial contamination is the sum of all emissions from gamed and simulated industries operating in the region. Automotive emissions are, for want of a better means of calculation, proportional to the employment potential of the various areas; employment potential is assumed to be a reasonable proxy for quantity of activity in an area. The total emission rate is a T.O.M.M. projection of the number of auto-miles traveled

in the city (as the access coefficients change so will the emissions) multiplied by the average emission rate per auto-mile. Space heating emissions reflect the number and composition of households in each area--lower class households live in homes with "less-clean" heating systems. Also, as the number of cycles of play increase, a trend toward use of cleaner fuels in households is built in.

The diffusion component is based on a standard form of the Gaussian Diffusion equation. It is assumed that there are only 29 point sources (the centroids of the analysis areas) and a maximum of 29 monitoring stations (again, each analysis area). The emissions from each source are diffused across the city seasonally so as to capture the differences in weather conditions occurring at different times of the year.

7. The Water Model. The primary objective of the water model (to provide capability for routing temperature BOD and DO, total dissolved solids, nutrients and coliform bacteria through a stream or canal system) is served by structuring separate models for each quality parameter and then coupling these models into an "integrated system" simulation package. Separately, one model is capable of representing the thermal behavior of a turbulent, fully-mixed stream. A second model describes the waste-assimilation characteristics in the stream, and a third provides for the routing of the conservative minerals. Linked together, the models provide the capability for simulation of the behavior of a given quality parameter within a branching stream or canal system as well as the capability for simulating the interrelationships between the various quality parameters.

8. The Newspaper Algorithm. Issues in the newspaper are generated from several sources. Selected issues are pre-set to appear in particular cycles. The state, national and a small sampling of local issues are of this type.

Many issues are part of a linked chain of issues. The decision made by the responsible player in resolving a given issue is used to trigger a response issue in the next-cycle newspaper. Sets of linked issues carry certain problems from the status of a mere annoyance to a status of one of several possible disasters. Players' actions select the disaster, or, in the case of expert decision making, the favorable outcome by forcing the linkages through a complex "decision tree."

Other newspaper issues are triggered by action or non-action in the game arena. Jurisdictions falling below pre-set arbitrary standards in their operating budget expenditures are cited in the newspaper. Similarly, analysis areas with a low level of capital investment per capita and/or unusually high levels of pollution are identified in newspaper headlines.

Finally, announcements of exofirms are pre-set by cycle for publication in the newspaper. Issues associated with the operations of selected industrial firms are also printed in the business page.

To see how these models are related to the main program, there are general flow diagrams which can be found in the Computer Operator's Manual.

# CHAPTER 6

## Chapter 6

## OPTIONS FOR THE GAME OVERALL DIRECTOR

The computer program of the METRO-APEX game is a rigorous, exacting, large and sometimes cumbersome vehicle. It can be a constraint on the activities of the game-- players regularly want to experiment with decisions or strategies that cannot be directly accommodated by the computer program. However, the program is far more flexible than one would believe at first glance and, therefore, the game is quite flexible too.

Various options in the game that can be used at the discretion of the Game Overall Director are described in this section. These options can be used to modify and supplement the game to add richness and depth, to accommodate or accentuate many special objectives of the Director and to deal adequately with unexpected issues that arise during play.

Included are a brief description of supplementary gamed roles, pseudo-roles, and various data options which the Game Director can use to influence the game. In addition to the options described herein, the Game Director may want to innovate by adding additional pseudo-roles, supplementary roles and STEP Exercises. By manipulating the game in these ways, the Game Director can alter the normal game pattern considerably.

Additional training exercises that supplement the normal play of the game can be inserted by the operator to add new issues and problems to the game or cover selected subjects in greater depth. These supplementary exercises are called STEPS, Supplementary Training Exercise Programs, and are discussed in the next chapter. The remainder of this chapter will take up the built-in methods for massaging the program, operator pseudo-roles and supplementary gamed roles.

### Pseudo-Roles

As was mentioned before, the basic gamed roles are the Politicians, Planners, Environmental Quality Agency, Developers, and Industrialists. These are the roles normally played with smaller groups.

In addition to these gamed roles, the Game Overall Director will often find it necessary or advantageous to introduce pseudo-roles by himself or by one of the role advisors.

Commonly required pseudo-roles are:

(1) Judge
(2) Federal Government Agency
(3) State Government Agency
(4) Exofirm Representative
(5) Simulated Industry Representative
(6) Public or Pressure Group Representative

(1) Serving as Judge.- Quite often, the Game Overall Director will be called upon to represent the judicial branch of government. Usually this legal pseudo-role will deal with cases of pollution control or zoning; however, other issues may require the rulings of the court. Fines can be carried out by forcing cash transfers from the guilty party to the government. (If available, skilled observers such as faculty may serve as Judge in lieu of GOD).

As an example of a court case, an Industrialist may contest the EQA's charge that he violated effluent standards. The Judge might be called upon to hear the evidence and pass judgment, including the assessment of fines and court costs. The Legal Reference Manual is designed to assist the operator by providing him with the necessary legal information to effectively carry out this pseudo-role.

(2 & 3) Federal and State Governments

a. Special Grant Awards. The only representative for the Federal and State governments in METRO-APEX is the Game Overall Director or a member of his staff. One of the functions of the government role is serving as a grants officer of the appropriate federal or state agency. During the game, the EQA will submit requests for funds to the government representative who negotiates with the county and its agency in setting the terms of the grant. Negotiations are likely to cover the amounts of the grant, the expenditure pattern of the grant and the amount of the county funding commitment. Funds are granted just for the cycle in which funds are to be used; however, a requirement for the presentation of a budget outline for a three year program could precede the granting of the first year's funds. Even if a three year plan is approved, grants are normally awarded to EQA with the specifics of each year's portion renegotiated annually.

The government roles may also represent other agencies, such as Departments of Housing and Urban Development, Health, Education and Welfare, Transportation, State Highway Departments, etc., within the government structure, with which cities may contract for certain projects. The government roles can set the terms of proposals, define the context of projects and negotiate the financial terms of grants. Thus, in much the same way that federal and state governments (in the real world) direct

local jurisdictions towards the use of certain programs, to address certain problems by controlling financial support, these roles can influence the course of a game and the stressing of selected issues by the participants. The mechanisms for making the cash awards associated with grants arising in this fashion are the special grants or cash transfers which are coded on the appropriate worksheets.

b. Pollution Regulation and Enforcement. The Legal Reference Manual contains a summary of State Pollution Regulations, the Federal 1970 Clean Air Act Amendments, Federal and State Water Pollution Control Legislation, Solid Waste Legislation and various other basic legal guidelines. The Game Overall Director has the option of starting the game with or without these laws in effect. In the air pollution control field, for instance, the game may be started with federally approved state implementation plans in effect or with such plans not yet approved and pollution regulations totally the responsibility of state and local agencies.

The federal or state government roles may allow the local EQA with its APCO, WQM and SWM functions to develop its own pollution criteria, standards, control strategy and emission regulations under the state enabling legislation; the roles may influence the local agencies' regulations by changing the state air pollution emission regulations (entered on the APCO coding sheet) or by pronouncing that state water pollution regulations have been adopted. The Game Director, through the government roles, may introduce the requirements to meet Federal Air Quality Standards, Automotive Emission Standards and New Source Performance Standards set by the Federal Environmental Protection Agency (EPA). If it is specified that the Federal Laws are in effect, the threat of direct EPA enforcement of those regulations may be used if the local agency does not adopt an adequate and effective program to meet and enforce those regulations. There are obviously many other levels and types of influence the federal or stage government roles may exercise. The choice or options used should depend upon careful consideration by the Game Director and staff of the type of group playing the game and the objectives of the particular exercise.

(4) Exofirm Representative. Each cyle the newspaper will list new exofirms wishing to locate in APEX County. The time and amount of Developer investment and Politician initiated projects required to lure the firm to APEX County are also specified in the newspaper. Often the Planners and EQA will want additional information before endorsing zoning changes or new projects ice., how many people will be employed, is this exofirm a potential polluter, etc.

The Game Overall Director or a staff member is normally designated as Exofirm Representative to handle such requests for information. The Game Director should provide the Exofirm Representative a listing of File 5 of the program which provides a summary of all exofirm data. The Exofirm Representative can also assist GOD in determining whether or not to "force

in" an exofirm (see Control of Growth Rate under Computer Data Options).

(5) Simulated Industry Representative. In addition to the seven gamed industries (those represented by players) there are 33 industries simulated in the computer. A pseudo-role in which the Game Overall Director or one of his staff acts as "representative" of the simulated industries is useful in many game situations.

Even though the Environmental Quality Agency personnel can determine a simulated industry's production rate, emission rate and emission control status by ordering a plant inspection or emission measurement on the industry, the players often request a "live" representative to talk to. It is more realistic and satisfying for many players if they have access to a representative from whom they may request additional information about the simulated industry, with whom they may discuss pollution control measures and against whom they may serve notices of violation.

The Simulated Industry representative may also work with the gamed industries in preparing an "industrial position" on many community issues and speak up for the simulated industries in hearings and STEP Exercises.

(6) Representing the Public. Two hundred thousand screaming extras are not usually kept in the wings to represent public opinion during a run of METRO-APEX. Sometimes, however, certain events in the game should logically trigger some form of citizen response not included in the newspaper or manifest in the community social indicator. The Game Overall Director can choose to use all of his power (cash transfers, yellow journalism, etc.) to back up a pseudo-role play action as a representative of an irate citizen or special interest group. Even with larger groups where the supplementary gamed roles of Newspapermen and Pressure Groups representatives are played, GOD may find it advantageous to add his "public response" to the game to stress some issue he feels is important but is not adequately represented.

## Environmental Quality Agency Role Options

The Environmental Quality Agency (EQA) is responsible for the achievement and maintenance of environmental quality in APEX County. Under this broad mandate the EQA will normally be interested in abatement of air and water pollution, solid waste disposal and in instituting categorical programs in noise, pesticides, radiological waste, etc. However, in order to allow GOD flexibility to tailor the EQA efforts to the group size and to his particular objectives for any group, a separate Role Manual and separate computer printout are provided for the EQA, Air Pollution Control Office(r), Water Quality Manager and Solid Waste Manager. This allows the Game Director to suppress or stress the APCO, WQM or SWM. For small groups where the EQA Office may be limited to one EQA director and a two man staff, the

Game Director may choose to concentrate on a single pollution problem such as air pollution. In this case, the WQM and SWM printout data may be given to the EQA in the first cycle only, for general information, or not provided to the players at all. If the Director wishes to stress agency management and organization he may wish to assign a number of players as EQA office personnel and let the groups organize themselves into an organization such as EQA director, APCO staff, WQM staff and SWM staff, or an EQA office with functional staff responsibility with duties (encompassing both air, water and solid waste pollution problems) assigned in terms of public education, legal staff, enforcement staff, etc. An alert Game Director can utilize the flexibility available in the combination of these roles to stress or teach many various aspects of environmental management and control. It should be noted, however, that the interrelationships between air pollution, water quality management and solid waste management (i.e. water treatment systems causing air pollution, air pollution scrubbers causing water pollution with competition between air and water pollution for scarce resources) makes the playing of the full EQA, APCO, WQM, and SWM roles much richer and meaningful than any abbreviated EQA role.

Supplementary Gamed Roles

With large numbers of players, the opportunity and need to represent other actors in the urban system suggest the creation of supplementary gamed roles. The pseudo-roles of the operator and his staff described in the preceding section (judge, government representatives, etc.) can be turned over to a gamed player if the situation allows for such multiple role play by participants. In addition to these roles, several gamed roles which may be played at Game Director's option have been successfully appended to the basic structure of the game.

The supplementary gamed roles differ from the pseudo-roles in that they are fully integrated into the game and are designed to be as rich and interactive as the basic gamed roles. All supplementary gamed roles have manuals and computer printout. In essence, the supplementary roles differ from the "basic" roles only in that they may be deleted for smaller groups of players without undermining the basic effectiveness of the game. On the other hand, the supplementary roles when played, greatly enrich the game and are recommended whenever possible.

Supplementary roles or role options for which materials are included in the kit include:

(1) The Newsmedia Role
(2) Pressure Group Roles
(3) County Chief Administrative Officer, City Manager Roles
(4) Regional Planners

(1) The Newsmedia Role. The newsmedia function is an extremely important, perhaps essential, catalyst in a successful METRO-APEX game. The

information transmitted and issues raised in the METRO-APEX NEWS and in the Video news has an important impact on the scope and direction of the game. It can also help to pull diverse elements of the game together (or initiate conflicts) and focus activity on certain community issues and problems. The duties of the Newsmedia role might include:

1. Soliciting and collecting news releases from players, editing the news and putting desired releases in the newspaper.
2. Preparing video-taped news broadcasts, man-in-the-street interviews, editorials and special programs for broadcast to the APEX community.
3. Preparing and making press releases during each cycle of play to accent important activities of the cycle.
4. Video taping and reporting on the STEP Exercises and editorializing on their impact on the community.

If METRO-APEX is played with a small group and insufficient participants are available to play the Newsmedia role, the Game Director and his staff normally try to perform at least the most important aspects of the role. Even if the Newsmedia role is being played by participants, the Game Director may find it beneficial to add headlines, issues and editorials which will focus attention on some issue or objective he considers important to the success of the game.

Unlike most of the other players, the Newsmedia role has no specialized information or computer output (except the newspaper and video news generated by the role); the main feedback is the player reaction and interaction resulting from the news presentations.

The Newsmedia role should carry out many of the functions common to other players, such as voting on the Elite Opinion Poll, running for office, participating in hearings, and so on. Because the role is supplementary and less well defined than the standard roles, it is likely to require greater creativity on the part of the player and, perhaps, greater assistance from the operating team.

A more thorough Newsmedia role description and details on how to prepare headlines and issues for inclusion in the newspaper are included in the Computer Operator's Manual and the Newsmedia Role Manual.

(2) Pressure Group Roles. Pressure Group roles in METRO-APEX add substantially to the intensity and realism of the game. As in real life, Politicians, public agencies and private profit-making organizations tend to make decisions based on their own self interest, on the immediate pressures facing them, or at best, on their own concept of what constitutes "good" for themselves and the community. If private and public interests

are represented in the game by only the Industrialists, Developers, and Politicians, and if the Pressure Group roles are not played, additional public inputs should be represented by the Newsmedia and Game Director inputs. Since many of the activities and decisions made by the Politicians and Planners affect the general public but do not deeply and directly affect the Industrialists or Developers, citizen reaction to these decisions and policies are much more keenly felt if citizen pressure groups are present to criticize and comment.

Citizen pressure groups often criticize public officials for making decisions in a vacuum and for deciding on complete plans and policies prior to the required "open hearing" in which these policies are publicly presented. Many citizen groups in the real world are now demanding that lay committees be involved in the early formative stages of planning and policy making; that pressure groups representatives be consulted before public officials decide "what the public needs."

This type of citizen activity can add greatly to the dynamics and realism of the game and STEP sessions.

A general Pressure Group role description and sample role descriptions for pressure groups are included in the Pressure Group Role Manual. Role descriptions are presented for the following Pressure Groups:

Labor Council
Welfare Rights Organization
EEO-Now
Good Government League
APEX County Taxpayers' Association
League of Women Voters
Chamber of Commerce
Community Coalition
APEX County Medical Society
APEX County Hospital Council
Sierra Club
PTA
APEX County Grange
Interfaith Church Council

Additional pressure groups descriptions and roles can be developed by the Game Overall Director (or the players) as required. Instructions for computer processing the pressure group decisions can be found in the Computer Operator's Manual.

(3) Chief Administrative Officer (CAO)/City Manager Roles. One of the most complex roles in METRO-APEX is that of the Politician, since this role is the focus of most public sector decisions. The Politicians are usually hard pressed to (1) absorb all of the informational inputs and demands made upon them, (2) organize these inputs into policy decisions, (3) implement

their policy decisions with projects and programs, and (4) structure their budget to finance the programs.

To allow them more time for general policy decisions and for more personal interactions with the other roles, the Game Overall Director may wish to free them from some of these duties by providing them with a CAO. The CAO can be of great assistance to the Politicians by preparing a recommended yearly program and budget, i.e., filling out their worksheet. The Politicians can then consider the CAO recommendations, question his justifications, and accept or modify his recommended program, projects and budget. The CAO serves at the direction of the Politicians and performs, for them, various duties. These duties may include administrative tasks, policy and budgetary recommendations, information gathering and coordination between government departments and agencies.

A City Manager/CAO role description is included in the CAO Role Manual.

(4) Regional Planners Role. Compared to most other roles, the Planners' role is unstructured and requires ingenuity on the part of the player. Each Planner's staff is responsible to either the city or county Politicians under the existing system. A Regional Planner's staff role, charged with comprehensive planning for the entire region, may be added to the game. Supplementing planning process with Regional Planners responsible to a larger political jurisdiction than those represented in the game adds a role which serves as a community conscience in the planning process.

It is expected that the Regional Planner's role, if employed, will be the coordinating force between city, suburb, and county. The larger issues of planning-- overall growth strategies, redistribution of income and wealth, coordinated transportation systems, comprehensive land use planning and so on-- should be considered and acted upon by the Regional Planner.

With larger groups the Regional Planners role can be expanded to cover many of the above roles in depth.

(5) Regional Planners/Transportation Planners Role. See Transportation Route Studies under Computer Data Options of this Chapter and the Regional Planner/Transportation Planner role description in Chapter 8.

## Computer Data Options

On the IBM 360/370, data input options are activated via card input at the start of each cycle or through utility programs that support the master program. The descriptions of the various options presented here are non-technical-- the concept or idea underlying each option is described. The technical details are included in the Computer Operator's Manual.

(1) Change the contents of the raw data files. A very dangerous, yet

very fruitful program manipulation is the modification of the raw data in the files. WARNING-- The changing of data files may prove hazardous to your health. Because of the highly interrelated use of certain data entries within the program, changes in that data often result in unwanted ramifications in unexpected places in the program.

The technical apparatus for changing data files is not overly difficult to use. Deciding what to change is the far more challenging aspect of the file modification option. For example, a decision to change residential units in a given analysis area from one type to another might seem like a fairly innocuous alteration. Some developer might strategize to upgrade existing units rather than to demolish and rebuild; therefore, such a change might be in order as there is no pre-set method for upgrading housing in the game. However, after the change is completed, many related variables such as density or selling price would still reflect the original land use distribution. Thus, the data would have some inconsistencies which could produce strange results such as an overly high selling price for that type of residential unit, the supply of which was increased by the file modification.

(2) Adding New Projects or Programs. Unlike the preceding option, the modification of the project or the program list is done prior to running the standard cycle in the computer. An utility program (fileprint) is provided for the IBM 360/370 to allow the operator to create and remove projects or programs from their respective lists. The technical description of this utility is included in the Computer Operator's Manual.

This option is available to enable the Game Director to accommodate player demands for additional programs or projects. Frequently, during the course of play, the Politicians or Planners develop strategies for which there are no pre-set projects or special programs. Occasionally, the existing definition of a project or program is unsatisfactory (for example, the cost may be too high or too low). In either case, a new project or program, or the deletion or revision of an old project, may meet the players' need.

(3) Game Director's Cash Transfer. One of the key flows in the game is the flow of cash. At times, the Game Director might find it desirable to infuse cash into the game for one reason or another. For example, GOD may choose to loan money to a Developer or Industrialist for a particular type of development. By using this option, the Game Director can "create" money by transferring cash into the accounts of the various players.

(4) Toying with the Candidate Election Process. The periodic reelection of City and County Politicians provides the Game Director with ample opportunity to change the course of the game. In its standard form, an election consists of a campaign by the candidates composed of decisions on how to spend campaign funds stressing various issues and campaign speeches to the gamed players, a vote by the game players, entry of these

decisions and the results of the vote to the program, and, lastly, a run of the Candidate Election Model. The Game Director can alter the standard form in a variety of ways.

Usually, an election is held every other year or cycle. If GOD chooses to give the current administration additional time to enact a program, the election can be held every three or four years or as often as he chooses. Similarly, if he chooses to oust an administration before two years have passed, an election can be held after only one cycle.

For any given election, GOD can exercise several options to influence the mode of proceeding through the election process. He can choose to have an active campaign, pairing gamed players in head to head contests, or a passive campaign, matching gamed players and simulated opponents. The former is the more exciting, the more time-consuming, and the more chaotic. If the option of matching gamed and simulated opponents is selected, the Game Director must decide on the character of the simulated opponent. The range is from the far left to far right. The explanation of the election input procedure can be found in the Computer Operator's Manual.

The energies of the players devoted to campaigning can be somewhat controlled by the Game Overall Director. Preparation of speeches, time spent giving and listening to speeches and the method of presentation are subject to his control. By varying the time that candidates are announced, the Game Overall Director can limit or exaggerate the influence of the election over the normal play of the game. Early declaration of candidacy (for example, the start of the election cycle) allows players to campaign as a part of their normal activities, but late declaration (after decisions are submitted but before computer processing) limits the election to extra-game activity.

Finally, sixty percent of the vote in a given candidate election is under the control of the Game Director. Caution should be observed, since the students usually become very involved in the election process. The question of "why was I defeated?" may prove embarrassing.

(5) Control of Growth Rate. The prime driving force behind the growth in the community is industrial development measured by the change in the number of jobs available in the county. Two options are available for manipulating the rate or direction of growth. The first is the forced input of exofirms (new industries expressing a desire to enter the community) and the second is the addition or subtraction of employees in selected analysis area in the county.

Each cycle, the newspaper lists industries wishing to enter the county. Ordinarily conditions for entry are set pertaining to capital investment or rezoning on the part of the Politician and investment by the Developers. In its simplest form, the exofirm option enables the operator to force the admission of a new industry in the analysis area of its choice overriding

the desires of the game players. Thus, the growth in the community can be stimulated by operator intervention. In its more complicated form, the exofirm option enables the operator to force the admission of a new exofirm in the analysis area of the operator's choice. In this instance, not only the rate of growth but the direction is influenced by Game Overall Director's action. The mechanics of this can be found in the Computer Operator's Manual.

(6) Industrialists Dividends, Production Level. If the Game Overall Director does not intervene the program will automatically deduct dividends from each Industrialist's cash balance. The automatic dividends are determined by deducting from the Industrialist's net profit all money over 5 figures, i.e. a net profit of $1,375,000 leaves a cash carry over of $75,000 and a net profit of $5,105,000 leaves a cash carry over of $5000. The Game Overall Director or Industrialist role advisor, acting as the Board of Directors, may change the amount of dividends paid out from $1.00 to the total net cash on hand.

This option allows the Director to influence the industries' cash accumulation and control the industries' capital available for plant expansion and/or pollution control systems. The Game Director or Industrial role advisor may wish to arbitrarily determine dividend payments or he may wish to negotiate the dividend amount with the Industrialist (plant manager). The option depends upon the Director's views on the desirability and timing of plant expansions, purchases of pollution control equipment, or other expenditures. The Director or Industrial role advisor, thereby, can affect the balance of public sector/private sector power in the game, manipulate the ability of the Industrialists to comply with EQA pressures for pollution control, or bring out other objectives or issues that the Director may see an opportunity to stress.

GOD may also intervene in the Industrialists plant operations by simulating a labor dispute, crop failure, natural catastrophe, etc., by decreasing an industry's production level for a particular cycle.

Labor disputes can be simulated by Pressure Group or pseudo-role contact with the industry managers or by newspaper headlines. If a wage contract settlement is successfully negotiated, the industries can be charged the new wage rates instead of the wage rates called out under "Cost Factors for Cycle X" in the Industrialist printout.

Another example of a realistic effect on an industry's production level can be demonstrated with Industry No. 7, Shick Cannery. The Cannery, in large part, depends on local agricultural production for the raw fruits and vegetables that it processes. Extremely bad air quality can be said to be decreasing crop yield and thereby put at least one industry on the side of controlling air pollution emissions. This industry's production can also be affected by simulated bad weather. GOD is left to his own ingenuity to create other issues and impacts, like those suggested above, as the needs

and objectives of the game dictate. Details of how to influence the computer data to affect dividends, production levels, etc. are outlined in the Computer Operator's Manual.

(7) Newspaper Headlines and Issues. Many of the Game Overall Director options mentioned previously are options to affect certain roles or the entire APEX community in order to stress or bring into contention certain important issues. The importance of the issues to the entire community can be spotlighted by insertion of pertinent headlines and issue/alternatives in the newspaper by the Game Director.

The "press" has a profound influence on what the public considers to be the issues of the day and an alert Director can exert strong influence over the community's activities by making use of this powerful tool. A detailed description of how to input newspaper headlines and issues is presented in the Computer Operator's Manual.

(8) MAPEX. In an average METRO-APEX game, nearly all the participants in APEX experience an information overload of some type. This is especially felt by players of the Planners Role. Complaints are generally of the following nature:

(a) too much material to digest
(b) no way to measure the relative importance of data
(c) no way to visualize changes in the data
(d) not enough time to interpret data, etc. ...

Clearly, supplementary means are helpful in presenting much of the Planners information. A program change to supplement the Property Distribution Data with bar graphs met with approval by those who used those charts. Subsequently, MAPEX (SYMAP-- Synagraphic Computer Mapping Program) was developed to map the data generated in the game. MAPEX is a method of generating pictures of an area showing relative shades of darkness and are produced by a computer printer. Since almost all of the Planners' data and some other data such as air pollution levels are given by analysis area, it was relatively easy to map this data.

Stress was placed on providing as much flexibility and user ease as possible. Currently programmed are 215 maps plus as many additional maps as the player can provide for. Most of the data files used in METRO-APEX, especially in the Planners role, consist of three unique files; stored as a "cycle zero file"-- initial starting conditions, a "cycle N file"-- the current cycle being played, and a "cycle N-1 file"-- the last cycle played. Since the player has an option of selecting any of the 70 maps including the selection of the cycle, this gives him 210 maps to choose from plus 5 additional maps which have been developed to print the diffusion data for the 5 air pollutants found in the same. An additional map has also been programmed to allow the player to supply the MAPEX program with any other

data that he has generated, providing it is presented by analysis areas.

A list of the MAPEX maps available in the program follows. A further description of the MAPEX program and how to order the maps from the computer is in the Computer Operator's Manual.

## LIST OF MAPS

| Map # | Map | Pre-set Ranges for A.A. |
|---|---|---|
| 01 | Population | 2000-20,000 |
| 02 | Unemployed | 50-500 |
| 03 | % Unemployed | 2-5.6 |
| 04 | % of Low Income | 2-20 |
| 05 | % of Deteriorating Buildings | 1.2-3 |
| 06 | % of Nonwhite | 10-100 |
| 07 | $ Streets | 1,000,000-5,500,000 |
| 08 | $ Sewers | 500,000-2,750,000 |
| 09 | $ Water | 250,000-2,500,000 |
| 10 | $ Parks/Recreation | 20,000-200,000 |
| 11 | $ Miscellaneous | 200,000-2,000,000 |
| 12 | TOTAL $ | 1,000,000-9,999,999 |
| 13 | Type (1) Housing | 100-1000 |
| 14 | Type (2) Housing | 100-1000 |
| 15 | Type (3) Housing | 100-1000 |
| 16 | Type (4) Housing | 100-1000 |
| 17 | Type (5) Housing | 100-1000 |
| 18 | TOTAL of Types (1-5) | 500-5000 |
| 19 | Sales Price of Dev. R-1 | 40,000-85,000 |
| 20 | Sales Price of Dev. R-2 | 20,000-38,000 |
| 21 | Sales Price of Dev. R-3 | 15,000-28,500 |
| 22 | Sales Price of Dev. M-1 | 25,000-47,500 |
| 23 | Sales Price of Dev. M-2 | 11,000-20,000 |
| 24 | Sales Price of Dev. Comm-Local | 120,000-255,000 |
| 25 | Sales Price of Dev. Comm-Regional | 160,000-304,000 |
| 26 | Sales Price of Dev. Ind-Local | 105,000-150,000 |
| 27 | Sales Price of Dev. Ind-Exog. | 150,000-240,000 |
| 28 | Sales Price of Dev. Office | 80,000-143,000 |
| 29 | Sales Price of Dev. Agri. | 1100-6500 |
| 30 | Appraised Value of Dev. R-1 | 20,000-47,000 |
| 31 | Appraised Value of Dev. R-2 | 10,000-23,500 |
| 32 | Appraised Value of Dev. R-3 | 7000-16,000 |
| 33 | Appraised Value of Dev. M-1 | 15,000-33.000 |
| 34 | Appraised Value of Dev. M-2 | 9000-14,400 |
| 35 | Appraised Value of Dev. Comm-Local | 120,000-300,000 |
| 36 | Appraised Value of Dev. Comm-Regional | 150,000-285,000 |
| 37 | Appraised Value of Dev. Ind-Local | 100,000-145,000 |
| 38 | Appraised Value of Dev. Ind-Exog. | 15,000-222,000 |
| 39 | Appraised Value of Dev. Office | 80,000-143,000 |
| 40 | Appraised Value of Dev. Agri. | 500-5900 |
| 41 | Appraised Value of VAC. Single-Residential | 2000-18,200 |
| 42 | Appraised Value of VAC. Multiple-Residential | 10,000-64,000 |
| 43 | Appraised Value of VAC. Commercial | 20,000-92,000 |

| Map # | Map | Pre-set kanges for A.A. |
|---|---|---|
| 44 | Appraised Value of VAC. Ind. | 10,000-48,000 |
| 45 | Appraised Value of VAC. Office | 20,000-92,000 |
| 46 | Appraised Value of VAC. Agri. | 500-5000 |
| 47 | TOTAL # of Market R-1 units | 100-1000 |
| 48 | TOTAL # of Market R-2 units | 100-1000 |
| 49 | TOTAL # of Market R-3 units | 100-1000 |
| 50 | TOTAL # of Market M-1 units | 100-1000 |
| 51 | TOTAL # of Market M-2 units | 100-1000 |
| 52 | TOTAL # of Market Single Residential units | 300-3000 |
| 53 | TOTAL # of Market Multiple Residential units | 200-2000 |
| 54 | TOTAL # of Market Residential units | 500-5000 |
| 55 | TOTAL # of Market Dev. Comm-Local acres | 10-100 |
| 56 | TOTAL # of Market Dev. Comm-Regional acres | 10-100 |
| 57 | TOTAL # of Market Dev. Ind-Local acres | 10-100 |
| 58 | TOTAL # of Market Dev. Ind-Exog. acres | 10-100 |
| 59 | TOTAL # of Market Dev. Office acres | 10-100 |
| 60 | TOTAL # of Market Dev. Agri. acres | 500-14,000 |
| 61 | TOTAL # of Market Dev. Non-Residential acres | 500-14,000 |
| 62 | TOTAL # of Market VAC. Single-Residential acres | 50-1850 |
| 63 | TOTAL # of Market VAC. Multiple-Residential acres | 50-1850 |
| 64 | TOTAL # of Market VAC. Comm. acres | 50-1850 |
| 65 | TOTAL # of Market VAC, Ind. acres | 50-1850 |
| 66 | TOTAL # of Market VAC. Office acres | 50-1850 |
| 67 | TOTAL # of Market VAC. Agri. acres | 50-1850 |
| 68 | TOTAL # of Market VAC. acres | 50-1850 |
| 69 | Density-Population/acres | 1-37 |
| 70 | Density-Dwelling Units/acres | 1-10 |
| 71 | Players Optional Map | Players must indicate ranges. |
| 72 | Air Quality Data - Particulates | 25-250 |
| 73 | Air Quality Data - Sulfur Dioxide | 10-100 |
| 74 | Air Quality Data - Carbon Monoxide | 1-10 |
| 75 | Air Quality Data - Oxides of Nitrogen | 25-250 |
| 76 | Air Quality Data - Hydrocarbons | 200-2000 |

(9) Transportation Route Study. The automobile is now considered the nation's number one air pollution source. Because of this, no air pollution emission control strategy is realistic without considering the automotive contribution to pollution. Even with full implementation of the Federal Auto Emission Standards, many communities will be hard-pressed to establish healthful air quality as long as the private automobile is the primary mode of transportation.

A situation can be established in METRO-APEX where this problem becomes apparent and therefore a topic of serious consideration. The Game Director can set the background air pollution level (BP Card) such that the EQA cannot meet the air quality standards even with automotive emission control and complete point source emission control. Handouts, newspaper headlines and STEP Exercises to consider automotive control strategies can help to dramatize this situation to the players. In considering automotive control strategies, the players will normally want to consider modified forms of public transport, from freeway construction to mass transit systems.

In order to encourage consideration of alternativ transportation models, Transportation Route Studies can be ordered from the computer. With the addition of mass transit projects to the project list, these studies can be used to determine the total project costs of various transit systems. A Regional Planning Group or Transportation Consultant would be an appropriate role to order such a study. The transportation issue naturally compliments the Planners land use planning since land use and transportation systems are inseparably related.

A Regional Planners role description which includes a Transportation Planning function can be found in Chapter 8 of this manual. The mechanics of ordering a transportation "route study" and transportation capital project implementation procedures are described in the Computer Operator's Manual.

(10) Additional Pollutional Control Devices. There may be occasions when GOD wishes to add additional pollution control equipment to an existing industry. By dumping File 53, File 58 and File 51, GOD can tell what equipment is currently available for each industry. To add equipment two criteria have to be met: (a) the piece of equipment to be added must currently be found in File 53 and (b) there is room in File 51 (for air pollution equipment) or in File 58 (for water pollution control equipment). See the Computer Operator's Manual for further information.

(11) Public Reaction to Smoke and Odor. GOD may wish to influence the "Complaint Table" found in the APCO's printout. He can increase or decrease the APCO's Complaint Table for any given cycle. The table will normnormally decrease as the cycles progress. See the Computer Operator's Manual.

(12) Addition of Background Air Pollution. In general, the air quality in APEX County is influenced by several types of pollution sources:

(a) Point Sources (industrial plants, open burning dumps, etc.)
(b) Line Sources (automobiles, airplanes, etc.)
(c) Area Sources (home space heating, etc.)
(d) Complex Sources (combination of above due to concentrated activity, i.e., shopping centers, sports arena, etc.)
(e) Background Pollution (contaminants already in the air mass as it crosses the area)

The Game Director may influence the air quality in APEX County to stress air pollution problems, such as pollution crises or episodes or consequences of shortage of high quality fuels, by changing background pollution levels.

The Game Director's option can be exercised by entering Background Pollution (BP) card inputs as explained in the Computer Operator's Manual.

The table below may assist him in selecting BP levels to achieve desired air quality values. The table shows typical values of the highest air pollution concentrations produced in APEX County in Cycle 1 due to BP inputs. This will give the Game Director only a rough guide or starting point; there are other intervening variables such as how many gamed industries are being played, the number of existing pollution control devices, etc.

| POLLUTANT TYPE | BACKGROUND POLLUTION ENTERED (BP) | CYCLE 1 AIR QUALITY MONITORED IN WORST A.A. (QUALITY MEAN) | FED PRIMARY A.Q. STDS. | "DANGER LEVELS" FROM REF.* |
|---|---|---|---|---|
| Particulate $mgm^3$ | 100 | 961.0 | 260 max. day | 1000 24 hour average |
| $SO_2$ $mgm/m^3$ | 12 | 24.0 | 365 max. day | 2620 24 hour average |
| CO $mgm/m^3$ | 10 | 16.8 | 10 max. 8 hr. | 58 8 hour average |
| NOX $mgm/m^3$ | 0.1 | 421.3 | 100 A.M. | 938 8 hour average |
| HC $mgm/m^3$ | 0.0 | 5777.9 | 160 max. 3 hr. | ____ |

(13) Change of Headwater Conditions or Runoff Conditions. GOD may wish to increase or decrease the level of water pollution in APEX County. He may wish to have the water entering the County be heavily polluted to start with. He does this using a Headwaters Conditions Card. Or GOD may wish to have the water in a specific reach be heavily polluted. He does this with a Runoff Conditions Card. More information can be found in the Computer Operator's Manual.

(14) Solid Waste Generation Factors. Each cycle the solid waste in the community is calculated from the solid waste generation factors found in File 25 and the total number of households existing in a specific ward. If the players come up with an unique way of handling solid waste in APEX County, GOD may wish to decrease the total amount of solid waste generated in a specific ward. Details can be found in the Computer Operator's Manual.

(15) Fee Charge for Private Collection of Industrial Solid Waste. Initially, the industrial solid waste in the community is being collected by private collectors. GOD may wish to represent these private collectors and change the initial rates or charge a different rate to each industry for his solid waste disposal. Information regarding the format of this card can be found in the Computer Operator's Manual.

(16) Operate or Turnoff Simulated Industries. The game may dictate that a specific industry be shut down; perhaps in violation of APCO or WQM laws, a court injunction, etc. GOD may turnoff that industry so it will no longer operate. Any of the simulated industries may also be forced to relocate in another part of the county. Note - This option is allowable only for the simulated industries. Instructions for making these changes can be found in the Computer Operator's Manual.

(17) Printing of Suburb, Township I, Township II Politicians and Planners Role. There are times when certain areas in APEX County wis to incorporate and form their own political jurisdictions. It might then be helpful to printout the Politicians' Budgets for these other areas. Some groups have used these other budgets to represent special districts which might be created in a community. These budgets are very similar in appearance to the Central City Politicans' Budget. However, if they are used, the following limitations should be noted:

(a) There can be no cash transfers to these jurisdictions. Money can be given through the use of the special grant option.
(b) No land purchases can be made directly by these jurisdictions. However, a project that requires land can still be initiated, as the computer will purchase the property needed.
(c) As there can be no land purchases by these jurisdictions, this implies that there can be no rezoning cards that list these political jurisdictions as the owner of the property.

# CHAPTER 7

## Chapter 7

## STEPS

Supplemental Training Exercise Programs (STEPs) were designed to enhance the METRO-APEX game through the use of structured sub-games within the context of the larger exercise. STEP Exercises provide an opportunity for players to temporarily step out of compressed "game time" and to re-enter "real time" for the purpose of focusing on certain specific issues. During a normal cycle of the METRO-APEX game, players are too busy making decisions on a myriad of topics to concentrate on any one. During a STEP Exercise, the pace changes and players are allowed to study one particular problem in detail.

The setting for a STEP Exercise can be conveyed verbally, or through the use of memos. In either case, the ground rules for the exercise must be stated explicitly. Sometimes players may be asked to limit their data to that generated by the computer within a given cycle and other times they may be asked to draw from additional sources. Sometimes they will be asked to continue in the assigned roles, other times they will be asked to assume new roles. Decisions made during a STEP are often binding on subsequent cycles if the situation arises naturally during the game run and the STEP fits logically into the sequence of events. Otherwise, they are independent. In order to minimize confusion, the Game Director must clearly distinguish between these alternatives.

Activities similar to STEPs will inevitably occur during the course of a typical cycle. The only difference between these activities and STEPs is the degree to which they have been pre-planned. Because of these spontaneous activities, it may be difficult to plan for a certain STEP to occur at a specified time. For example, a STEP Exercise on setting air quality standards may be scheduled to follow cycle 4 but the Air Pollution Control Officer may decide that he needs to consider air quality standards sometime during cycle 2. At this point, the Game Director may choose to intervene and delay the activity until the scheduled time, thereby risking some loss of spontaneity. Or, the Game Director may choose to let the spontaneous activity continue and simply cancel the planned STEP. With this choice, there is a risk that presentations will be less sophisticated since there has been no time to prepare. There is no simple solution to this problem. Each Game Director will have to analyze the trade-offs and choose the style that best meets his objectives.

Each STEP Exercise involves approximately two hours, excluding preparation time, and should be followed by a thorough critique usually requiring another hour. This means that a total of three hours should be allotted

for most STEP Exercises. (This could be a convenient block of time in which to process the decisions from a preceding cycle of METRO-APEX. Players could then be given a new computer printout at the close of the STEP.)

It is often useful to videotape parts of the exercise and use the replay as a starting point for the critique; however, this is by no means necessary. Another useful aid is to have a short but well chosen list of books to be considered reference or required reading for each STEP.

Included in this chapter are suggestions for the preparation of STEPs and samples of STEP Exercises covering several topic areas. Care should be taken to choose a logical sequence of STEPs which build upon each other when possible. The STEPs described below are flexible in design and should be tailored to meet the needs of a particular group. It is the job of the Game Director not only to choose appropriate STEP's but also to expand or limit them as necessary. (Additional STEP's can, of course, be designed as needed.)

Most of the example STEPs included here have the format of a public hearing, interview or trial. This in no way implies that the innovative Game Director should not experiment in the use of other types of STEPs; such STEPs might be short games, exercises or presentations between or during cycles of METRO-APEX.

## Town Hall Meeting

Objective: To provide an opportunity for each student to prepare and deliver a short speech; to serve as an incentive for students to study role manuals and the background information on the APEX community; to provide an opportunity for each student to develop a short policy statement; to familiarize students with roles other than their own.

Description: The setting for this STEP is a Town Hall Meeting to which all the community has been invited. The purpose of the meeting is to give all the citizens of APEX County a chance to get to know their community leaders. Each student plays the role of a different community leader and as such is called upon to give a short speech introducing himself. These speeches should be about five minutes in length and draw upon information in the role manuals, background information on APEX County and any other lecture materials. It is helpful to have the speeches videotaped and to replay them during the critique. Both the content and the manner of presentation should be discussed in the critique.

Preparation: Staff should 1) prepare and distribute handouts, 2) secure the assistance of a Professional to help critique the speeches, if desired, 3) announce the meeting in the newspaper, 4) prepare a room for the meeting with a podium for speakers and props such as maps of the community, and 5) arrange

for a video camera to be close enough to get a clear picture of each person as he delivers his speech.

Students should 1) read role manuals, 2) study other literature on the APEX community, 3) prepare a short speech, and 4) prepare an agenda, if serving as moderator.

Suggested Handouts: 1) Newspaper headline announcing the meeting; 2) Memo to Chairman of the Meeting; 3) Letter to Politicians, Industrialists, Developers, Planners, and APCO staff asking each of them to speak on a certain topic.

## Power Plant Rates

Objective: To introduce students to the relationships between regulatory agencies where authority overlaps; to demonstrate the relationship between the costs of expansion and rates charged to the consumer; to encourage students to explore the problems associated with supplying electrical power to a growing community.

Description: This exercise involves a meeting of the Public Utilities Commission in which the Plant Manager of the Shear Power Company will propose a rate increase. The Company has been forced into a position where it must expand its productive capacity in order to meet both the present and projected power needs of the community. Since large capital outlays are necessary to purchase the required land, buildings, and equipment, the Plant Manager will propose a rate increase to defray some of these costs. It will be up to the Plant Manager to develop supporting data concerning the projected demand for power, the effects of the proposed rate increase on the income/expenditure picture of his plant, the implications of the proposed rate increase for the different power users, etc.

All citizens should consider the implications of the proposed expansion and rate increase. The Environmental Quality Agency, however, has a special interest in the proposal, since the power plant is among the largest potential polluters of the community. The Planners, also, have a special interest in this porposal and its possible effects on the growth pattern and direction of the County.

Preparation: Staff should 1) assign students to play the role of the Public Utilities Commission, 2) prepare and distribute handouts, 3) make file changes, if necessary, to put the plant in a position where it is forced to expand, 4) collect extra data on the power plant, if necessary.

Students should 1) research implications of power plant expansions, 2) prepare a short release for the Gazette summarizing need for expansion and extent of proposed rate increase, 3) prepare formal presentations including visual materials, if desired.

Suggested Handouts: 1) Memo to those being asked to serve on Public Utilities Commission, 2) Memo to Plant Manager of Shear Power Plant from his Board of Directors, 3) Gazette release announcing the public meeting of the Utilities Commission, 4) Data sheet on power usage in APEX County.

## Strike Against a Gamed Industry

Objective: To expose students to the trials and tribulations of labor relations, to provide the opportunity for students to participate in formal negotiations.

Description: The Game Director, the Labor Pressure Group role, or some designated agent acts out the role of a labor union negotiator pressing for higher "wages and fringe benefits" from a particular gamed industry, except the power plant. The areas of contention may include the wage rate, length of new contract, length of work week, etc. Arguments for higher wages might include the skyrocketing cost of living, the relative position of the industry as compared to similar firms, the relative rate in the industry as compared to the prevailing rate in the region, etc.

The strike may be enforced if agreement is not reached by reducing the production rate set by the Industrialist to reflect the percentage of the year that workers went out on strike. That percentage may be function of the time spent in negotiation-- each 10 minutes might represent another month (8.6%) without production. Input of a new wage rate is achieved by a simple file change (described in the preceding chapter). The agreement must take into account the "cost of living factor," based on the Consumer Price Index, because such a factor is automatically applied by the computer.

This STEP would probably not involve the entire group and might be activated during the normal play rather than between cycles. It is used primarily to complicate and enrich the role of the Industrialist.

Preparation: The labor representative should 1) carefully select his demands to put pressure on the Industrialist, 2) inform the Industrialist of the strike deadline and the nature of the repercussions of not reaching settlement, 3) receive information on industry's pay levels and union demand, 4) negotiate union demands with the industry, 5) act as a communication link between industry and union, 6) insure that full news coverage is afforded labor negotiations and 7) report the outcome of labor negotiations on an appropriate form.

Suggested Handouts: 1) Memo to labor representative; 2) Memo to Industrialist; 3) Pay level/demand information; 4) Newspaper headline.

## Addition of a Major Industry

Objective: 1) To force participants to consider the advantages and disadvantages of unusual economic growth, 2) to emphasize the need for and difficulty in achieving long-term comprehensive planning, and 3) to create a situation in which the larger group must agree on a single policy despite the obvious differences in rewards to individuals within the group.

Description: The Game Director or his designated agent announces that a large industry is interested in moving into the community. The announcement should be made near the end of a cycle to allow debate and discussion to go on between cycles.

Preparation: The representative of the industry should be prepared to describe the characteristics of his industry-- land needed, employees needed, equal opportunity employment policy, addition to the tax base, and pollution profile. He should also be prepared to specify demands on the community-- investment in streets, sewer or water, tax break, police or fire protection, public housing project nearby, improvement in mass transportation, or zoning variances.

The players should come up with a coherent planned package to accommodate the new industry, if in fact, they choose to admit it at all.

Suggested Handouts: 1) Newspaper announcement; 2) Memo to industry representative.

## Election Debate

Objective: To serve as a mechanism for evaluating the Politician's performance; to encourage discussion about the important issues in the community; to give students experience in making campaign speeches.

Description: This exercise should take place just before election ballots are to be cast. Some time prior to the STEP, all those running for office should be notified that they will have an opportunity to make a campaign speech which will be taped if videotape is available and shown during the STEP. The Game Director may also decide to provide time for supporting speeches. During the STEP the speeches are normally presented in the following order: incumbent's speech, challenger's speech, supporting speeches for incumbent, supporting speeches for challenger. (If videotaping facilities are not available, those speeches could also be given "live.")

Following the showing of the speeches, the incumbent and the challenger may be allowed to rebut each other's campaign platforms. The Game Director

may choose to structure this part of the STEP in such a way that there is a formal debate on some preplanned topic or on some issue that arises in the course of the game.

After the speeches and rebuttals, the students cast their ballots. If there is no challenger for an office, one is supplied by the Game Director/computer. It should be made clear that students are voting merely as an elite-- there is an entire community within the computer that will also vote. The gamed players' votes will be fed into the computer and will be just one of many factors deciding the outcome of the election. Some of the other factors include the EOP voting records and the past performance of the incumbent. These can be discussed in the critique of the election results.

Preparation: Staff should 1) announce the upcoming election in the newspaper, 2) distribute memos, 3) designate computer challengers, if needed, 4) arrange for videotaping of campaign speeches, and 5) prepare and count ballots.

Students should 1) prepare campaign speeches, 2) prepare supporting speeches, and 3) campaign informally throughout the game.

Suggested Handouts: 1) Newspaper headline announcing time and place of election; 2) Newspaper headlines for players to announce their candidacy; 3) Memo to Incumbent Politician; 4) Memo to Challenging Politician; 5) Election ballots.

## Presentation of Master Plan

Objective: To provide an opportunity for the Planners to prepare and present a detailed city and county master plan; to encourage the community-at-large to consider the goals and future direction of the county as determined by the plan.

Description: The County Board of Supervisors will call for a public hearing to consider a five year Master Plan for APEX County to be presented by the City and County Planners. The plan should begin with a thorough discussion of both short and long term goals and objectives for the community. The plan may also include a discussion of land use, housing, employment, education, transportation, open space, commerce and industry, urban renewal, and sources of revenue for APEX County.

Following the presentation by the Planners, there will be an opportunity for any interested members of the community to speak. The Air Pollution Control Staff should consider any implications of the proposed plan for the future quality of the air in APEX County. The Industrialists and Land De-

velopers should also consider any implications of the plan for the future of their interests.

Preparation: Staff should 1) generate interest in the plan with items in the news media, 2) collect sample planning documents to help the students, 3) prepare and distribute memos, 4) provide materials for student displays, if desired, and 5) provide an existing (inadequate) Master Plan as a starting point.

Students should 1) study representative planning documents from cities with similar problems, 2) prepare a written summary of the major elements of the plan, to be distributed to the community before the meetings, and 3) prepare a formal presentation including visual materials if appropriate.

Suggested Handouts: 1) Gazette notices, 2) Memo to County Board of Supervisors, and 3) Memo to Planners.

## Hiring an Air Pollution Control Officer

Objectives: To familiarize the student with the recruiting process; to give the student experience in preparing a resume and filling out application forms; to provide an opportunity to prepare and evaluate interview questions; to familiarize the student with some of the typical tasks and responsibilities of an Air Pollution Control Officer.

Description: This exercise deals with the recruiting of an Air Pollution Control Officer for APEX County and encompasses the various stages of the recruiting process including filling out applications, formulating resumes, taking written examination, conducting oral interviews, and carrying out the final selection process. All students are asked to apply for the position by presenting a resume and a completed application. The Game Director may decide to administer a written examination as an additional part of the application process. After all the applications are received and rated, a certain number of the students are informed that they will be given an oral interview as the final stage of the application. From the remaining students, two or three are asked to serve on the Oral Interview Board. A Professional Personnel Officer may be on the Board also. The rest of the students are asked to watch the interviews on closed circuit television, if available, and be prepared to critique both the questions and the answers. Each interview takes approximately fifteen minutes with time before and after for the Board to discuss and rate each candidate. Shortly after all the interviews are conducted, the Board announces their choice for the new Air Pollution Control Officer. In the critique, an opportunity is provided for the Board to explain why they chose one particular candidate over the others. Opportunity may also be given for the candidates to reply and for the observers to add their comments.

Preparation: Staff should 1) prepare and distribute appropriate handouts, 2) contact a Professional Personnel Officer to help with the oral interview, if desired, 3) initiate news media items relevant to the coming exercise, 4) plan, administer, and correct written examinations, 5) review and rate applications, resumes, and written exams, 6) set up a room for the interview with closed circuit television, and 7) distribute to the members of the Oral Interview Board a folder on each of the candidates which includes the applicant's resume, application, and written exam, an interview schedule and an evaluation sheet.

Students should 1) prepare an application and resume, 2) take the written examination, 3) familiarize themselves with the characteristics of APEX County, especially those relevant to the air pollution situations, 4) familiarize themselves with the job specification for the position of Air Pollution Control Officer, and 5) if serving on the Oral Interview Board, look over resumes, applications, and written examinations and prepare several key questions for each applicant.

Suggested Handouts: 1) Announcement for news media; 2) APCO Job Specification; 3) Application form; 4) Written examination; 5) Letter to Oral Interview Board; 6) Letter to top scoring applicant; 7) Sample evaluation sheet.

## APCO Application for Federal Grant

Objective: To acquaint students with the management techniques of PPBS and network analysis and to give them experience in the use of these techniques; to familiarize students with the various elements and/or subsystems of an Air Pollution Control Agency; to acquaint students with the Federal Grant Application Forms and the importance of establishing a "workable program."

Description: The Air Pollution Control Officer and his staff are asked to prepare a budget and an application for a three year federal establishment grant. This application requires the formulation of a "workable program" which is defined as "a comprehensive statement of objectives for the prevention and control of air pollution and the current and proposed measures to achieve these objectives." Some of the topics that should be covered are: 1) a description of the applicants' legal authority and responsibility for the administration of the air pollution control program, 2) a description of the nature, effects and extent of the actual and potential air pollution problems, including an identification of the major sources of air pollution, and 3) a description of the applicants' administrative organization, procedures, facilities, financial and other resources, and staff, together with plans for changes and development. (See Federal Register, Vol. 32, No. 104, Title 42).

This exercise is designed to encourage Air Pollution Control Officers to utilize systems analysis techniques in formulating their agency's pro-

gram. They will be referred to the Executive Order of August 25, 1965, which requires that all Federal Budgets be prepared using the techniques of PPBS (Planning-Programming-Budgeting System). The Air Pollution Control Officers may be asked to use network analysis charts to delineate the various stages needed to accomplish the goals and objectives of the air pollution control agency. For example, the acquisition and operation of monitoring stations involves a series of progressive stages beginning with the establishment of objectives for the program and going through a determination of the type of equipment and personnel needed, to operation of stations with fully trained maintenance personnel, and finally to an evaluation of the type of equipment and personnel needed, to operation of stations with fully trained maintenance personnel, and finally to an evaluation of the program. The budgetary requirements associated with each stage should also be delineated on the network analysis charts.

After completing the network analysis charts and the associated budgetary requirements, the APCO staff will fill out a Federal Grant Application Form. (The Game Director may choose to eliminate sections of it which seem less relevant than others).

All these activities are in preparation for the actual STEP Exercise which involves a formal presentation of the completed budget and grant application form to a Federal Review Team. Following the formal presentation by the APCO and his staff, the Review Team will begin an extensive question and answer period. All of the students that are not involved as part of the Review Team or as the APCO staff should take notes indicating the questions they would ask as members of the Review Team and specific strong and weak points of the APCO presentation.

A possible modification of this STEP involves the presentation of a budget request to the County Board of Supervisors, rather than the Federal Government. In this case, it could be an open hearing with an opportunity for all students to state their feelings concerning the air pollution control program for the county. Memos could be written to players in all roles encouraging them to challenge the APCO proposal on certain specific grounds.

Preparation: Staff should 1) procure copies of the Federal Register and Grant Application forms, 2) prepare and distribute handouts, 3) announce the meeting in the APEX Gazette and invite the public if it is to be an open hearing, and 4) arrange a room to resemble a hearing room with a table for Federal Review Team and a table for the APCO staff.

Students should 1) familiarize themselves with the literature on systems analysis, PPBS, and network analysis, 2) read the appropriate section of the Federal Register, and 3) prepare a budget and Federal Grant Application.

Bibliography: Evarts, Harry F., Introduction to PERT, Allyn and Bacon, Inc., Boston, 1964, pp. 1-44.

"Planning-Programming-Budgeting System: A Symposium," Public Administration Review, Vol. XXVI, No. 1, March, 1967, Washington, D.C.

Federal Register, Vol. 32, No. 104, Title 42, part 56, Tuesday, May 30, 1967.

Suggested Handouts: 1) Memo to APCO staff; 2) Memo to Federal Review Team; 3) Newspaper headline; 4) Federal Grant Application Form.

## Hearing on Air Quality Standards

Objective: To familiarize students with the criteria used in the quality standards; to synthesize and digest the federal documents in this area; to provide an opportunity for the community-at-large to understand the necessity and consequences of the federal standards.

Description: As background for this STEP, APEX County as a designated part of an Air Quality Control Region must formulate a plan for achieving the air quality specified by the Federal Primary and Secondary Air Quality Standards. The Governor of the State will hold hearings in each of the counties involved in the region. At these hearings, the Governor's Representatives will solicit recommendations for methods to achieve federal air quality standards as input to the state implementation plan. Input will be received first from the APCO staff and then from other interested citizens. Part of the process will be to make clear to the public the importance of meeting the standards and the solicitation of their support in the measures necessary to achieve them.

The Game Director may decide to limit the discussion to one or two pollutants, such as particulates and sulfur dioxide. The Federal Air Quality Criteria documents should be available for all the pollutants to be discussed. These documents summarize the available information on the relationship between exposures to air pollutants and their effects on man and his environment, including injury to health, damage to materials and vegetation, reduction of visibility, and economic losses. The federal publications which report on available control techniques (and the Federal Register which promulgates the air quality standards) should also be made available.

The meeting should begin with a formal presentation by the APCO and his staff, in which they explain the standards, the criteria used in setting the standards and state their recommendations for achieving them in APEX County. There will then be an opportunity for presentations by other interested members of the community who have notified the Governor's Representative that they would like to be on the agenda. Following the formal presentations, there may be an opportunity for the community to respond with questions or further comments.

Preparations: Staff should 1) announce the meeting in the Newspaper, 2) collect literature on the subject, and 3) prepare and distribute memos.

Students should 1) study federal documents, and 2) prepare formal presentations.

Bibliography: "Guidelines for the Development of Air Quality Standards and Implementation Plans," U.S. Department of Health, Education and Welfare (May, 1969).

"Air Quality Criteria for Sulfur Oxides," U.S. Department of Health, Education and Welfare, (January, 1969).

"Air Quality Criteria for Particulate Matter," U.S. Department of Health, Education and Welfare, (January, 1969).

"National Primary and Secondary Ambient Air Quality Standards," Federal Register, Vol. 36, No. 228, Thursday, November 25, 1971, Part 50.

The Clean Air Act, Environmental Protection Agency, Washington, D.C., December, 1970, U.S. Govt. Printing Office, 1971, 0-413-241.

Suggested Handouts: 1) Newspaper headline; 2) Memo to Governor's Representatives; 3) Memo to APCO staff, and 4) Notice to community-at-large.

## Smog Alert/Emergency Procedures

Objective: To place students in a situation where they have to react to an emergency condition; to demonstrate the need for a comprehensive plan for dealing with emergencies.

Description: There are two ways that this STEP can be handled; one involves surprise and the other does not. If the element of surprise is to be retained, the students will be prepared for this STEP only through indirect means. There will be a series of headlines which warn of an upcoming disaster. These will be planned so that the early headlines are of a wild and speculative nature, and the later ones are more sensible, believable and urgent. There could also be an editorial on the videotaped news broadcast which predicts an emergency situation in APEX County if more stringent air pollution control measures are not enacted. Then, on the day of the STEP Exercise, the news media would report that APEX County had entered into a disaster situation. The computer printout of the APCO role would reflect the disaster situation with greatly increased background pollution levels, and double or triple the usual number of citizens' complaints. The exact cause (if known) and the duration of the disaster would be determined by the Game Director and reported in the news.

In reaction to the disaster, the County Board of Supervisors will call an emergency hearing to determine what can be done. The APCO staff will be requested to submit their plans for dealing with the situation, and may be asked to explain why the situation was allowed to occur in the first place. The Board may request other citizens to submit suggestions also.

If it is not important to retain the element of surprise, this STEP can be structured in a different way. A hearing to discuss emergency procedures can be called as a preventative measure, to determine appropriate measures in the event of a disaster. If a disaster actually occurs, it would take place sometime after the meeting, and it would be a means of testing the workability of the plan that was adopted.

The advantage to this second format is that students can prepare for the STEP by doing research into different methods of handling emergencies, and they will have time to come up with a complete and thorough proposal. The advantages of the first format is just the opposite-- students are placed in a situation for which they are probably unprepared. It may be possible to combine the two formats in such a way that some advantages of each are retained.

Preparation: Staff should 1) prepare news headlines, 2) prepare an editorial, 3) prepare and distribute memos, 4) make appropriate file changes.

Students should 1) research methods of handling emergencies, 2) devise an emergency plan of control to be implemented in APEX County.

Suggested Handouts: 1) Newspaper headlines, 2) Memo to County Board of Supervisors.

## Meeting with Citizens' Groups

Objective: To expose students to the problems arising from dealing with radical, potentially disruptive groups; to encourage the Air Pollution Control Office to develop an effective, workable plan of air pollution control which involves the citizens of the community.

Description: Students will be asked to act as members of two citizen groups which are concerned with fighting air pollution. One group is the local chapter of the Stamp Out Smog (SOS) Organization, and the other is a radical group of students from the University. Each of these groups will have to get together before the STEP to determine the goals and objectives of their respective organizations. It is assumed that the SOS group is the more moderate of the two, and will come to the STEP with "reasonable" proposals for air pollution control. The student group, on the other hand, should be encouraged to develop very radical proposals.

This meeting can be structured around a specific topic, such as the possibility of a new industry entering APEX County, or the structure can be left very loose. The SOS group will be asked to call the meeting and invite the students and the Air Pollution Control Officer to attend. They should announce that the purpose of the meeting is to discuss the possibility for citizen action in the fight for cleaner air in APEX County. If there is a more specific topic, it would, of course, be announced also.

The Air Pollution Control Office should recognize that they are guests at this meeting, but should take the opportunity to develop plans for utilizing citizen volunteers in their control programs, if appropriate. A possible modification of this STEP is to turn it around so that the Air Pollution Control Office has initiated the meetings, and the citizens' groups are the guests.

Preparation: Staff should 1) assign roles, 2) prepare and distribute memos, 3) provide a place for pre-meetings as well as for the STEP itself, and 4) provide for news coverage of the event.

Students should 1) meet in their respective groups to determine the goals and objectives of their organizations, 2) research various plans for citizen action and involvement in control programs, 3) set the topic and publicize the meeting, if they are the SOS group.

Suggested Handouts: 1) Memo to SOS members, 2) Memo to Student Environmental Group, 3) Memo to APCO.

## A Trial

Objective: To familiarize students with the role of the court in air pollution control; to expose them to the administrative requirements of prosecution; to give them experience in building and developing a court case; to allow them to play the role of expert witness.

Description: The Game Director will choose one industrial plant to be the target for the STEP. (Obviously, it would be better if the selection of the defendant evolved naturally from the game. But because this STEP requires so much preparation it is better if the students know the defendant beforehand.) This plant will be instructed to initiate, or continue in a policy of non-compliance with Air Pollution Control rules and regulations.

The Air Pollution Control Office will be forced to take some action to remedy the situation. They will be encouraged to exhaust all administrative remedies before resorting to civil or criminal proceedings (see Legal Reference Manual for discussion of civil vs. criminal proceedings). It generally takes at least five cycles of play for the Air Pollution Control Office to gather sufficient information to build a thorough court case.

One or two students should be asked to serve as attorneys for the defense, and likewise for the prosecution. It may be helpful, also, to have a lawyer or law student advise each side-- especially in relation to legal technicalities. The remaining students could be assigned by either the defense or prosecution to act as witnesses. Some of the witnesses that the prosecution may need are: inspectors, source test engineers, a chemist, a meteorologist, an epidemiologist, and complaining citizens. The defense may want to call as witnesses: the plant manager, an engineer, a consultant on control systems, a consultant chemist, and area residents.

Sometime before the STEP, the defense and prosecution will have to come to agreement on items concerning the physical conditions of the plant (stack locations, stack heights, etc.), the actual items of inspection, and the prevailing weather conditions and the in-plant operations at the times of the inspections.

The trial itself requires more time than most STEP Exercises. Both sides should be given about fifteen minutes for opening statements. Then each will need approximately two hours to develop their respective cases. After the presentations, about fifteen minutes should be provided for closing statements.

Preparation: Staff should 1) arrange for legal assistance, if necessary, 2) assign roles, 3) arrange for a moot court room to use for the trial, if possible, 4) help students prepare cases by providing information on precedents, court procedures, etc.

Students should 1) study case precedents and court procedures, 2) prepare witnesses, and 3) develop cases.

Suggested Handouts: 1) Appropriate sections of Legal Reference Manual, 2) Memo to industrial plant manager from his Board of Directors, and 3) Memo to APCO staff from the County Air Pollution Control Board.

## STEP EXERCISE EXAMPLE

## APEX: ROLES AND GOALS

OBJECTIVES:

As citizens of APEX County and as the new leadership of the community, it would be helpful to the successful execution of your new jobs to:

1. become acquainted with the other community leaders;
2. become somewhat familiar with roles other than your own;
3. think about and express your views of the more important problems and goals of APEX County; and
4. begin inter-role communication.

SETTING:

The setting will be a "town hall meeting" in which each role will be given time to deliver a short speech on:

1. the functions, organization and goals of his role as he views them;
2. the major problems and goals of the community as his role views them; (See the attached background information: "The Continuing Crises in APEX");
3. the balance between "growth and the quality of life" for APEX County; and
4. any other physical, social, political or economic views he considers important.

TIME ALLOTTED:

Each role will be allotted qpproximately 3-5 minutes for their presentation. The chairman of the meeting will allow questions and comments as he deems appropriate. The chairman will set up the agenda of speakers.

ASSIGNMENTS:

| | |
|---|---|
| Chairman of the Meeting | County Supervisor |
| Roles Speaking | County Politicians<br>City Politicians<br>County Planners<br>City Planners<br>Environmental Quality Agency<br>Industrialists<br>Developers<br>News Media<br>Citizen Pressure Groups |

(Ask your role advisor for help for information or references you require for preparation.)

## BACKGROUND MATERIAL FOR ROLES AND GOALS STEP

### THE CONTINUING CRISES IN APEX COUNTY

APEX County exhibits many of the current trends and problems of America's urban areas. Some of these are:

1. A city with a deteriorating central core occupied primarily by poorly housed people who (a) have low incomes, (b) have a low level of skills, (c) are aged, (d) are unemployed, and (e) want to move out.

2. A flight to the suburbs (by those who can afford it) with accompanying urban sprawl and "helter skelter" development.

3. Industry is largely downtown and thus workers from the suburbs commute daily by private automobile causing congestion and pollution.

4. No adequate public transit system exists.

5. Pollution in the Central City by far exceeds those levels necessary for good health.

6. A shortage of high quality (clean burning) fuel is predicted for next year.

7. If industry cuts back its fuel usage, more unemployment and fewer taxes will result.

8. Industrial growth might provide jobs and taxes but cause more pollution and congestion.

9. Inadequate resources and disagreements about the proper methods for solution to these problems have caused a "stalemate" up to this time-- much talk but little effective action.

10. The conditions in the Central City are getting worse year by year.

11. GO BACK TO 1.

(The Planners, Environmental Quality Agency and other roles have more specific data on the above general trends.)

## STEP EXERCISE EXAMPLE

## APEX POWER COMPANY RATE HEARING

The objectives of this exercise are to introduce participants to the relationships between regulatory agencies where authority overlaps; to demonstrate the relationship between the costs of expansion and rates charged to the consumer; and to explore the problems associated with supplying electric power to a growing community.

At the request of the plant manager of the Shear Power Company, there will be an open hearing before the County Board of Supervisors serving as the Public Utilities Commission. The purpose of this hearing will be to consider a proposal for a rate increase. The Shear Power Company feels that it must expand its productive capacity in order to meet the projected power needs of the community. Since large capital outlays are necessary to purchase the required land, buildings, and equipment, a rate increase is being proposed to defray some of these costs. The plant manager's proposal should include such supporting materials as current and maximum production levels, projected demand for power, (the effects of the proposed rate increase on the income/expenditure picture of the plant), overall dollar increase per family, per month, and the implications of the proposed rate increase for the different power users, the costs of buying power from outside sources, etc.

The following table summarizes the power usage in APEX County during Cycle 1.

| Category of Power User | % of Power Used by Each Category | Amount of Power in MWH Used by Each Category | Price/ MWH | Average No. of Users (per year |
|---|---|---|---|---|
| 1. Commercial | 26% | 780,000 | 10.00 | 86 |
| 2. Governmental* | 6% | 180,000 | 9.00 | 5 |
| 3. Industrial | 33% | 990,000 | 6.00 | 42 |
| 4. Residential | 35% | 1,050,000 | 12.80 | 67,000 |

*Governmental refers to public uses of power, such as street lights, public athletic fields, governmental buildings, etc.

The above information is based on the following:

1. Total power usage of 3,000,000 MWH per year
2. 67,700 families in APEX County
3. 42 Industrial Users in APEX County

Since this is an open hearing, all citizens of APEX are urged to attend and to consider the implications of the proposed expansion and rate increase. The Air Pollution Control Office, however, has a special interest in the proposal since the power plant is among the largest potential polluters in the community. The Planners, also, have a special interest in this proposal and its possible effects on the growth pattern and direction of the County.

## STEP EXERCISE EXAMPLE

## MASTER PLAN PRESENTATION

OBJECTIVES:

The objectives of this STEP are to provide an opportunity for the Planners to prepare and present a detailed City and County Master Plan; and for the community-at-large to consider the goals and future direction of the County as determined by the plan.

PRESENTATION:

The County Board of Supervisors has called for a public hearing to consider a five year Master Plan for APEX County to be presented by both planning departments. The presentation should begin with a summary of current status of APEX County and the short- and long-term goals and objectives of the proposed plan. The plan should include a discussion of land use, transportation, industrial gorwth, employment, urban renewal, education, economic and environmental impact and the cost and schedule proposed for implementation.

Following the presentation by the Planners there will be an opportunity for any interested members of the community to speak. The Environmental Quality Agency should consider the implications of the proposed plan for the future quality of the air in APEX County. Likewise, the Land Developers should consider any implication of the plan for the future of their developments, and the Industrialists should consider the impact of the plan upon their future growth possibilities and tax status. The media and pressure groups should press for explication of any points they wish to raise.

REFERENCES:

1. The House We Live In
2. The Limits to Growth
3. The Relationship of Land Use and Transportation Planning to Air Quality Management
4. A Guide for Reducing Air Pollution through Urban Planning
5. Library and Course Materials

## STEP EXERCISE EXAMPLE

### TRANSPORTATION AGENCY JOB INTERVIEW

The objectives of this STEP are to familiarize students with the recruiting process; to provide an opportunity to prepare, answer, and evaluate interview questions; and to familiarize students with some of the typical tasks and responsibilities of a transportation planner.

This exercise deals with the recruiting of a transportation planner for APEX County and encompasses the various stages of the recruiting process including filling out applications, formulating resumes, taking written examinations, conducting oral interviews, and the final selection process. Students will be asked to apply for the position by presenting a resume, a completed application, and by taking a short written examination. After all the applications are received and rated, the top candidates will be given an oral interview as the final stage of the application. Students are requested to dress as if they were attending a formal interview for a position in a regional planning agency.

Two students will be asked to serve on an Oral Interview Board. They will be given a packet for each candidate including his resume, application, and written examination. Using this information, and the results of a fifteen to twenty minute oral interview, each member of the Board will compare evaluations, and then announce their choice for the new transportation planner for the Regional Planning Department (County Planners).

In the critique, the Board will be asked to explain why they chose one candidate over the others, and the candidates will be given a chance to reply. The remaining students will watch the interviews on closed circuit television, and should be prepared to critique both the questions and the answers.

(Reference: Handout materials)

ASSIGNMENTS:

| | |
|---|---|
| Oral Interview Board | Board Selected by Staff (plus two students designated) |
| Interviewees | Top Five Candidates Selected from Applicants |

STEP EXERCISE EXAMPLE

MASTER PLAN UPDATE AND IMPLEMENTATION

PART I - LAND USE
PART II - TRANSPORTATION

OBJECTIVES:

The objective of this STEP is to allow the Planners to consider, prepare and present their detailed plan for implementing the Master Plan. The presentation will be made at an open hearing to the Politicians and community leaders. Interested citizens will be allowed to participate. The Politicians will decide to accept, modify or reject the suggested implementation items and methods.

BACKGROUND:

A land use/transportation Master Plan was previously presented by the Regional Planning Department to a City/County hearing board. The five year and twenty year plan was tentatively approved by the hearing board subject to periodic review.

A new slate of Politicians have now been elected and have appointed new Environmental, Land Use and Transportation Planners. The new Politicians and Planners may update, revise and refine the Master Plan if they so desire. The Planners in conjunction with the City and County Politicians, Environmental Quality Agency, community leaders (Industrialists, Developers and citizen groups) have now prepared a more detailed approach to implementing the plan.

THE ISSUE:

A Master Plan has been adopted in terms of broad objectives. An organized implementation of this plan requires more detailed preparation of methods,

strategies, specific projects and schedules, consideration of yearly and total costs and resources for providing the funds required.

A Regional Planning Department Implementation Plan will be presented to the Board. Prior to the presentation, the Land Use and Transportation Planners should cooperatively develop an integrated implementation plan. This plan should recognize the importance of developing a desired land use pattern and supplementing this goal with a transportation system which services and encourages the desired changes.

The two-part presentation may include such items as:

1. A planning review for any suggested Master Plan update, revision or refinement.

2. Details of the Master Plan implementation such as:

   a. Objectives:
      -ultimate planned land use
      -development type and mix
      -development density (acres, population)
      -recreation and open areas
      -public/private transportation
      -public/private services and facilities
   b. Policy and Strategies:
      -zoning
      -codes, minimum standard housing
      -land reservation and open area provisions
      -transportation programs
      -introduction of technological innovation
      -tax incentives/penalties
      -bonus concessions
      -loan insurance and guarantees
      -public relations campaign
      -community advisory councils
      -civic, citizen organization, pressure group participation
      -urban renewal
      -demonstration projects
      -training programs
      -mandatory planning review
   c. Projects and Programs:
      -specific list of projects and programs required
      -specific list of rezoning requests
      -order of priorities
      -implementation schedule (time)
      -implementation costs (yearly and total)

d. Funding Source Allocation:
   -regional contribution (city, county)
   -state
   -federal
   -private, non-profit, foundations
e. Financing Method/Proportion:
   -taxes
   -general obligation bonds
   -revenue bonds
   -lease purchase
   -joint powers authorities
   -special districts
   -private, foundation, etc. commitments
   -grants, matching funds

## STEP EXERCISE EXAMPLE

## APCO BUDGET HEARING

OBJECTIVES:

The objectives of this STEP are to provide an opportunity for the Air Pollution Control Officer and his staff to develop a workable program for their agency; to allow the Politicians to consider the APCO budget request in light of the total community needs; and to allow the community-at-large to respond to the air pollution control program.

THE HEARING:

In accord with State Regulations, the annual APCO budget request will be presented to the County Board of Supervisors at an open hearing. Some of the topics that should be covered in the APCO presentation are: (1) a description of the nature, effects, and extent of the actual and potential air pollution problems in APEX County, including an identification of the major sources of air pollution, (2) a description of the administrative organization, procedures, facilities, financial and other resources, and staff, together with plans for changes or development, and (3) a description of the agency's legal authority and responsibility for the administration of the air pollution control program.

SCOPE OF PRESENTATION:

It is suggested that the presentation can be made effective by assuring that there is an organized approach such as:

1. Statement of the problem
2. General plan for a solution to the problem
3. Steps to be taken in following the plan
4. Schedule of time to accomplish steps
5. Facilities, manpower, and resources required to accomplish plan
6. Cost of plan (minimum, medium, maximum)
7. Critical points at which to check plan progress
8. Results to be expected if plan is successful

The public will be encouraged to attend this open hearing and state their feelings concerning the air pollution control program for the County.

## STEP EXERCISE EXAMPLE

## OPEN HEARING BEFORE COUNTY BOARD OF SUPERVISORS

## APCO PRESENTATION ON THE IMPACT OF AUTOMOTIVE EMISSIONS

OBJECTIVES:

**To familiarize participants with:**

1. The automobile emission control provisions (Title II, Part A, Section 202-213) of the Federal 1970 Clean Air Amendments.

2. The interrelationship of automotive emission control strategies and National Ambient Air Quality Standards and the impact of these requirements on overall community transportation planning.

3. The numerous control strategies (such as inspection, enforcement, driving restrictions, tax incentives, staggered work days, land use restrictions, highway construction limitations, alternate transportation system, others) which may be considered for achieving these requirements.

4. The social, economic, legal, political and educational implications of an Automotive Control Strategy on a Transportation Master Plan.

BACKGROUND:

The automobile is now considered the nation's number one polluter. Urban transportation, which is now predominantly automotive, represents a serious problem in terms of both congestion and pollution.

The Federal Government has set automobile emission standards for new

cars which specify the maximum emission levels of hydro-carbons, carbon monoxide and oxides of nitrogens. EPA has announced a schedule of maximum automotive emission levels for these pollutants for the years 1970 through 1975. These standards must be met by each automobile model during its "useful life." States (except California) are prohibited from setting emission standards for new vehicles but have the right and primary responsibility to control emissions from other vehicles and to achieve and maintain federally established Air Quality Standards. If they fail to meet these responsibilities, however, EPA has authority to enforce pollution controls directly.

APEX County has been designated an Air Quality Control Region and as such is preparing its contribution to the State Implementation Plan and is holding hearings on recommendations for inclusion in the plan.

HEARING: An open hearing has been called by the County Board of Supervisors to hear an APCO presentation on the status of automotive emissions in APEX County and the automotive emissions impact on future transportation system planning. Questions include:

1. What is the contribution of automotive emissions to current APEX County air quality?
2. To what degree will these emissions change in the future?
3. Can APEX County meet the Federal Air Quality Standards with these future levels of emissions?
4. What alternatives in terms of automotive control strategies, low pollution transportation systems, etc. can be suggested?

Because of the interrelationship of automobile emission control and the Air Quality Standard requirements, the APCOs have been instructed to work with the City and County Planning Staff to insure an integrated plan with consideration of land use, highway construction and overall community transportation needs in the emission control strategy.

Formal presentation will also be made by representatives of the Industrialists and Developers expressing their views and interests in respect to the problem. Comments and suggestions from other members of the public will be encouraged at a time deemed appropriate by the Hearing Board.

ASSIGNMENTS:

Chairman of the Meeting
Representatives of County Board
Representatives from City Council
Coordination of APCO Presentation
Planners Presentation & Comments
Industrialists Presentation & Comments
Developers Presentation & Comments

REFERENCES:

1. A Citizen's Guide to Clean Air, The Conservation Foundation, 1717 Massachusetts Ave., N.W., Washington, D.C. 20036
2. Profile of Air Pollution Control, Air Pollution Control District, County of Los Angeles, 434 South San Pedro Street, Los Angeles, California 90013.
3. The Clean Air Act, December 1970, EPA Washington, D.C.

## STEP EXERCISE EXAMPLE

## EMISSION STANDARDS

The objectives of this STEP are to force the APCO to translate views on control strategies into an operational format; to provide an opportunity to explore various methods of controlling air pollution (such as tax credits, air rights, permit systems, zoning ordinances, etc.); and to give the student experience in working with controversial legislation.

Pursuant to Section 110 of the Federal "Clean Air Amendments of 1970" (P.L. 91-604, December 31, 1970) the state in which APEX County is located is required to submit to EPA an implementation plan to establish and maintain Federal Ambient Air Quality Standards in APEX County (which has been designated an Air Quality Control Region).

Since this implementation plan is not prepared and ready for approval, the County is currently operating under the limited air pollution regulations of the State Health and Safety Code (see Legal Reference Manual, Vol. 21.1).

Based on the current air quality of APEX County, the APCO has determined that improved air pollution regulations are needed now and is proposing the enactment of new regulations.

In accordance with the state enabling legislation, a public hearing is required before new regulations concerning air pollution can be adopted. Therefore, the County Board of Supervisors, sitting as the APEX County Air Pollution Control Board, has requested that a proposed set of Emission Regulations be presented in an open hearing.

The Board will be responsible for preparing an agenda and for presiding at this meeting. Each member of the Board will represent his constituents, as well as the community as a whole. The Board should be prepared with questions concerning the need for emission standards, the cost and effectiveness of the proposed regulations, the associated personnel and equipment requirements, and so forth.

The APCO staff should present a written document containing the proposed emission regulations for APEX County. An Industrial Committee should also present a plan for emission regulations which should be as thorough as the APCO proposal.

ASSIGNMENTS:

Air Pollution Control Board
APCO Presentation
City Politician
Industrialist Presentation
Planner Presentation
Developer Presentation

## STEP EXERCISE EXAMPLE

### THE TRIAL

The objectives of this exercise are to familiarize the students with courtroom procedures, the administrative requirements of prosecution, the preparation of a case, the role of the expert witness, and the role of the court in air pollution control.

The People's Pulp Plant has continued in a policy of non-compliance for several years. They have been instructed by their management to continue this policy.

It will be the job of the APCOs to 1) design new legislation if necessary; 2) secure passage of legislation; 3) exhaust administrative remedies available for use with violators; 4) file a proper legal action; and 5) prosecute the violators.

There are several ground rules for this exercise beyond those normally in effect. First, there must be agreement upon the following factors by the APCOs and the Pulp Company.

Points of Agreement:

Physical Conditions such as stack locations, heights, etc. (see attachment)
Times of Inspections and weather conditions, etc. (see attachment)
Witnesses and Roles
In-Plant Operations at time of inspections

If agreement cannot be reached, the staff will settle the issue. Secondly, the APCOs must submit the formal complaint upon which the trial will

be based. Thirdly, there will be no change in cycle for the purpose of this STEP after Cycle 3.

Finally, the prosecution and defense attorneys must arrange their time to allow each witness listed below to testify.

ROLE ASSIGNMENTS:

| | |
|---|---|
| Prosecution | Attorney #1 |
| Suggested Roles: | Attorney #2<br>Inspector<br>Inspector<br>Test Engineer<br>Chemist<br>Meteorologist - consultant<br>Epidemiologist - consultant<br>Complainant |
| Defense: | Attorney #1 |
| Other Suggested Roles: | Attorney #2<br>Plant Manager<br>Engineer<br>Consultant - source test engine<br>Consultant - physiology and particulates<br>Chemist - consultant<br>Area resident/former plant manag<br>Area resident |
| May be called by prosecution or defense - | County Medical Director |

The staff can be requested to fill a role if required.

REFERENCES:

1. Attachment on People's Pulp Plant
2. Industrial Pollution Control Handbook, Herbert F. Lund, McGraw Hill, 1971, Chapter 18.
3. Air Pollution, Volume III, Stern, Academic Press, 1968, Chapter 39.

BACKGROUND ON PEOPLE'S PULP PLANT:

The APCO performed an emission measurement on People's Pulp Plant during Cycle 0.

Results of the measurements (this is considered an official document and part of the APCO records):

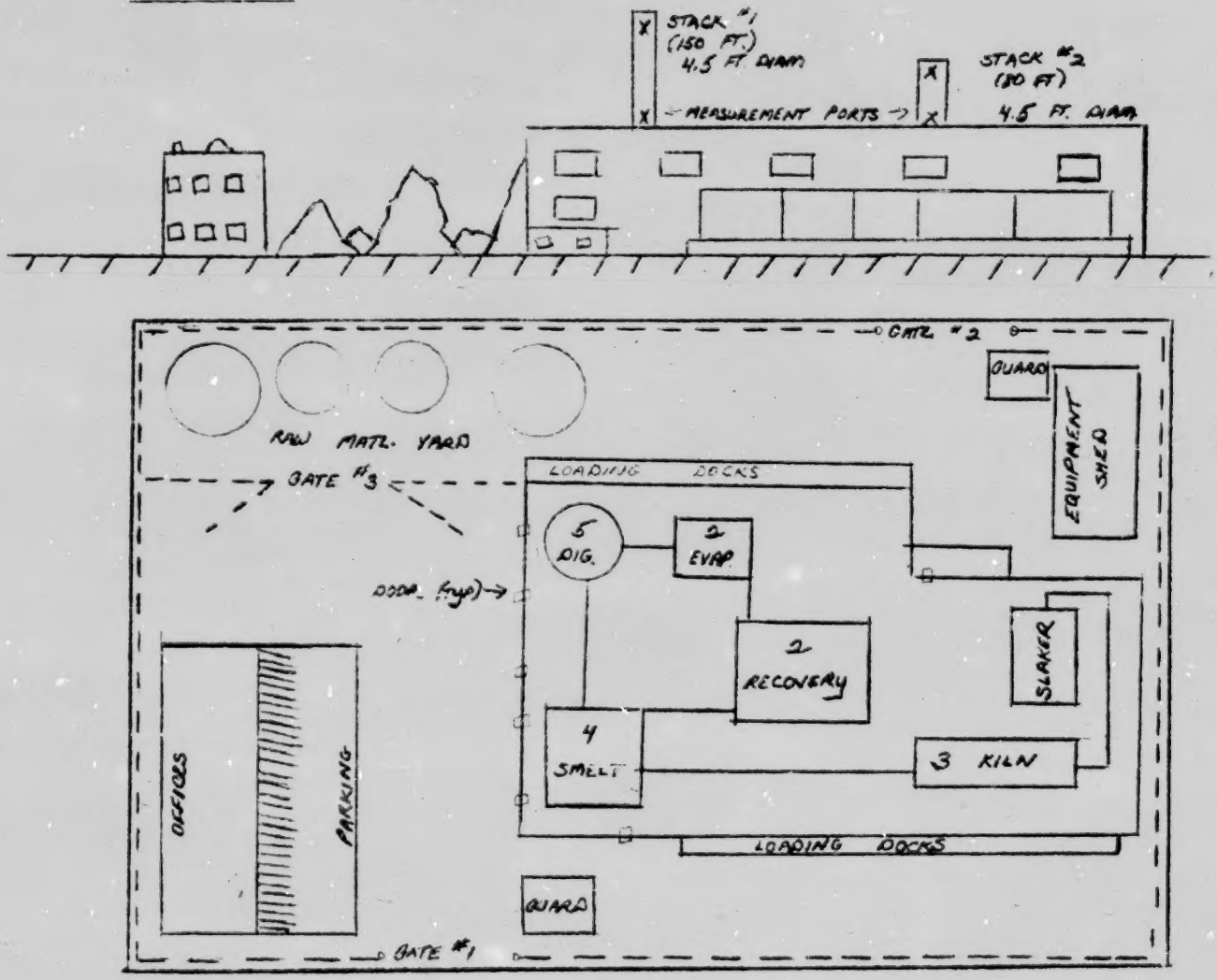
| Industrialist No. | Process Name | Rate | Type | Control System |
|---|---|---|---|---|
| 2 | Combustion | 39 BBl/Hr | Lo oil | 0 |
| 2 | Recovery | 300 Tons/day | | 0 |
| 2 | Kiln | 300 Tons/day | | 0 |
| 2 | Smelt | 300 Tons/day | | 0 |
| 2 | Digester | 300 Tons/day | | 0 |

| Process Name (cont.) | Odor | Smoke | #/Hr. Part. | $SO_2$ | CO | $NO_x$ | Hc |
|---|---|---|---|---|---|---|---|
| Combustion | 0 | R - 0 | 17 | 511 | 0 | 236 | 0 |
| Recovery | PD3 | R - 0 | 3000 | 125 | 0 | 20 | 0 |
| Kiln | 0 | R - 0 | 1000 | 3 | 0 | 40 | 0 |
| Smelt | PD3 | R - 0 | 225 | 1 | 0 | 0 | 0 |
| Digester | PD3 | R - 0 | 0 | 0 | 0 | 0 | 0 |

Since this emission measurement, People's Pulp has made no effort to install control equipment.

The plant, established in 1957, occupies a 27.5 acre site in AA-2. Nine acres are presently developed with factory buildings and facilities. No further company-owned land is available at present site for plant expansion.

PLANT LAYOUT: (not to scale)




| | | |
|---|---|---|
| Stack No. 1 - | Process No. 1 | Combustion |
| | " No. 2 | Recovery |
| | " No. 3 | Lime Kiln |
| Stack No. 2 - | Process No. 4 | Smelt Tank |
| | " No. 5 | Digester |

## STEP EXERCISE EXAMPLE

### PRESENTATION OF IMPLEMENTATION PLAN

The objectives of this STEP are to force the APCO to translate views on control strategies into an operational format; to provide an opportunity to explore various methods of controlling air pollution (such as tax credits, air rights, permits, zoning ordinances, transportation planning, etc.); and to give the student experience in working with controversial legislation.

Pursuant to Section 110 of the "Clean Air Amendments of 1970" (P.L. 91-604), the state in which APEX County is located is required to adopt and submit to the Administrator of the Environmental Protection Agency a plan which provides for the implementation, maintenance, and enforcement of the nationally-established Ambient Air Quality Standards within each Air Quality Control Region. APEX County has previously been designated an Air Quality Control Region.

To this end, the State Government has requested that each air quality region including APEX County, hold a public hearing in which the APCOs will present the proposed Implementation Plan. The County Board of Supervisors, sitting as the APEX County Air Quality Control Region Board, will be responsible for preparing an agenda and for presiding at this meeting. Each member of the Board will represent his constituents, as well as the community as a whole. The Board should be prepared with questions concerning the procedure used in determining the proposed control strategy, the cost and effectiveness of any proposed regulations, the associated personnel and equipment requirements, and so forth. An understanding of Section 110 of the 1970 Clean Air Act is necessary to understand the requirements of an implementation plan.

The implementation plan should include attainment of primary and secondary standards, emission limitations, schedules, timetables, land-use and transportation controls monitoring system, review procedures for location of new sources, provision for intergovernmental cooperation, program of funding, personnel, authority, etc.

Early in the cycle on the day of the STEP, the APCO staff should post a written document outlining the proposed plan. The in-depth presentation will be given at the afternoon STEP Exercise. An Industrial Committee should prepare reactions and proposed alternatives, to be presented formally by their representative. The Planner should also formally respond to the planning implications of the proposal. There will be an opportunity for the public to speak too.

## STEP EXERCISE EXAMPLE

## ENVIRONMENTAL QUALITY AGENCY FORMATION PROPOSAL

**OBJECTIVE:**

The objective of this STEP is to allow the Air Pollution Control Officers, the County Board and other interested members of the community to consider organization, functions, responsibilities, and authority of a proposed Environmental Quality Agency for APEX County.

**BACKGROUND:**

Representatives of the Good Government League, the APEX County Taxpayers Association and various environmentally-oriented interest groups have long realized the need to attack the problem of environmental pollution in a coordinated manner. These groups along with the support of several governmental officials have taken their position of support for a total environmental approach to the Environmental Health Planning Agency. The proposal is for the establishment of an APEX County Environmental Quality Agency. The proposed Environmental Quality Agency would include the long-established Air Pollution Control Office and Solid Waste Management Office and also assume responsibilities for other environmental problems and areas of concern in APEX County.

The proposed responsibilities of the Agency are: to develop an environmental quality management plan for APEX County including all functional areas of pollution control (air, water, solid waste, noise, etc.); to develop the necessary coordination between governmental agencies; to develop community based goals and community commitment to the plan; to secure the required financial resources and to direct the EQA activities.

**STEP PREPARATION:**

In preparation for the STEP, the Environmental Health Committee will develop a presentation including the justification for a total-environment agency approach and the nature of the proposed agency including the organization, functions, responsibilities, authority, funding and relationships to other governmental elements.

Interested groups and individuals will present their views on a proposed all-environment agency including their opinions on the authority, responsibilities, organization and functions. In addition, these presentors should respond to the presentation of the Environmental Committee.

The setting for the STEP is a County Board of Supervisors hearing concerning the proposed Environmental Quality Agency. The Chairman of the hearing will ask questions to determine the benefit of various elements of the

testimony presented at the hearing. Before the close of the hearing, the Board will determine, by a method of their choosing, whether to be in favor of such an agency and if so, what elements of the various presentations they would favor in regards to the nature of the agency.

RESPONSIBILITIES FOR STEP:

County Board
Environmental Health Committee Presentation
APCO Presentation
Industrialist Group Representative's Presentation
County Planner's Presentation
Developers Group Representative's Presentation
Chamber of Commerce Presentation

Other interested citizens desiring to make a presentation at this hearing are requested to contact the chairman of the hearing. Other comments and questions from the audience will be accepted at the time of the hearing.

## STEP EXERCISE EXAMPLE

## POLLUTION: SOURCES AND SOLUTIONS

### PART I

OBJECTIVES:

The objectives of this STEP are to provide an opportunity for the EQA and the Planners to jointly prepare and present to the Politicians and the community an explanation of:

1. The nature and extent of the pollution in APEX County;
2. The impact of this pollution on health welfare, property and living quality;
3. The sources and amount of pollution by source type (i.e., point, line, area, complex source);
4. The current methods of control and reduction of pollution and the estimated effectiveness of these methods; recommendations for immediate adoption of interim control methods.
5. Comments as to the potential impact of the Federal Environmental Protection Agency Complex Source regulations on transportation, land use and growth.

SETTING:

1. The County Board of Supervisors have called on the EQA and Planners

to put together and present an integrated presentation answering the above objectives.

2. The County Board and City Politicians, in joint session, will hear the presentation in open hearing with the community leadership invited to attend.
3. At the conclusion of the hearing the Board will allow comments and questions from the people at the hearing.
4. The Politicians will be asked to each make a short statement as to their view of what the community goals should be in light of these problems and what initial steps should be taken toward a solution.
5. The Politicians will request the EQA and Planners to prepare, with Private Sector and Citizen Group inputs, a joint plan proposing guidelines and strategies for pollution control implementation. (To be presented in STEP, Part II).

ASSIGNMENTS:

Chairman of the Meeting
EQA Presentation Coordinated by EQA
Planners Presentation
Other Presentations Coordinated by Chairman
Questions and Comments Coordinated by Chairman

PART II

BACKGROUND:

The previous presentation (PART I) dealt with the current pollution problem in APEX and a discussion about current pollution control methods and regulations.

OBJECTIVES:

The objectives of this STEP are for the EQA and Planners to prepare, with Private Sector and Citizen Group inputs, a joint plan proposing guidelines, strategies and methods for pollution control implementation including:

1. Summary of the interrelationships between land use, transportation, population, life style, etc., and pollution in APEX County and the long range changes necessary to effect solutions.

2. Recommended regulations, procedures, controls, penalties, incentives, etc. for immediate adoption to improve local control; estimate of the resources required.

3. Recommendations to the State and Federal Government on needed legal, technical and financial assistance for effective local implementation.

4. The steps and schedule for implementation.

SETTING:

1. The County Board of Supervisors has called on the EQA and Planners to put together and present an integrated presentation answering the above objectives. The Politicians have requested that the EQA/Planner presentation include Private Sector and Citizen Pressure Group inputs and considerations. If an integrated plan cannot be arrived at due to basic disagreements, the Private Sector Industrialists, Developers and Citizen Pressure Groups will be expected to present a "minority report" outlining their views and recommended implementation strategies. The Politicians are facing an election next cycle and they would like to be sure that they have all points of view prior to adopting new pollution control measures.

2. The County Board and City Politicians, in joint session, will hear the presentation in open hearing with the community leadership invited to attend.

3. At the conclusion of the hearing the Board will allow comments and questions from the people at the hearing.

4. The County Board and City Council will each formally adopt a plan or elements of a plan at the opening of the Press Conference later today. (The adoption may be modified at any time by the Politicians at a formal open meeting of the City Council or County Board.)

## STEP EXERCISE EXAMPLE

## JOINT PRESS CONFERENCE BY POLITICIANS

OBJECTIVES:

The press conference will be held to allow the Politicians to make a formal statement on the final long term pollution control/land use plan they have adopted. This will be their final joint statement to the community prior to election time. Majority and minority views may be expressed but the statement should include a clear statement of the plan adopted by formal vote of the County Board and the City Council.

Following the Politicians' "formal statements" they will submit to questions by the news media and the audience. These questions and answers will be televised and broadcast to the entire public in prime time by the KAPX Television Station.

COORDINATION OF THE PRESS CONFERENCE:

Moderator - KAPX News Media
County Supervisor
City Councilperson

## STEP EXERCISE EXAMPLE

## ENVIRONMENTAL POLLUTION CONTROL STRATEGIES

OBJECTIVES:

The objectives of this STEP are:

1. To provide a format in which various alternative methods of pollution control regulation may be proposed and debated. The proposals should include consideration of new and innovative approaches in addition to the usual civil and criminal penalty methods.

2. To allow the Politicians and the community to adopt and support any regulation methods and supportive legislation and test the impact and effectiveness of these approaches in METRO-APEX.

BACKGROUND:

The APEX County Air Pollution Control Office has been in existence for 5 years. Air quality in APEX County is deteriorating. This problem is considered by the residents and their elected representatives as an increasingly serious health hazard and a detriment to the full enjoyment of daily life. The APCO has attempted to improve air quality by reducing industrial pollution. The method used was the setting of pollution emission limits for industry with misdemeanor criminal penalties ($500 fine and 6 months in county jail) for violations. The APCO initially attempted to get voluntary compliance agreements with industry; but even under the threat of penalties industry has moved slowly and reluctantly (if at all) to correct the problem.

There is little incentive except threat of small fines for industry to rush to make the large capital expenditures required to install pollu-

tion control systems; there is little or no incentive for industry to try to efficiently maintain and operate the equipment. In addition, a large inspection and policing staff is required on a permanent long term basis to insure continued control system operation and maintenance. Also, air, water, solid waste and other types of pollution are often interrelated and not subject to direct Air Pollution Emission Regulations or direct Water Pollution Effluent Regulations.

Advocates of other methods of pollution control, such as subsidization, tax incentives, award payments, pricing systems, emission fees and auction or market systems, point out that there are many ways to control pollution. These various innovative methods may be capable of being mixed together to obtain the most effective control. Many advocates attack the approach of standard emission level laws and forced control as "bandaid" attacks on symptons not causes of pollution.

In February, 1971, the President called for emission charges on sulfur oxides and taxes on leaded gasoline. The 1970 Clean Air Act Amendments, Section 110, discusses "emission charges or taxes or other economic incentives or disincentives."

A Special Task Force has been created by the County Board and City Council acting together to study, discuss and propose alternative approaches to pollution control other than the current find and fine system. This Task Force has been asked to look at the system interrelationships of air, water, solid waste, etc. pollution and consider the economic, social and political aspects of new and innovative approaches to pollution control.

A few of the types of approaches the Task Force has been considering are:

EPA approval required for zoning and rezoning
Performance Codes and Standards
Energy Consumption Restrictions/Taxes
Carrying Capacity Regulations
Transportation Restrictions/Auto Use Limits
Fuel Consumption Taxes
Fuel Type Regulation and Restrictions
Emission Fees - Pollution Taxes
Tax Concessions/Write-offs
Fuel rationing
Maximum Community Fuel Usage
Subsidization of Control Systems
Growth Restrictions - Population Freeze
Product Price Subsidies
Production Limitations
Pollution Emission Limitations based on Air Quality Levels
Pollution Generating Product Taxes

Yearly Environmental Impact Reports for Industry
Property Sale Taxes/Use Taxes
Pollution Liability Bonds - Insurance
Referendum Required for Growth
Ban on Specific Industries
Ecology Commission
Pollution Warrants

The Task Force will present its recommendations and alternative recommendations to the City/County Politicians at open hearing. The public will be given a chance to present their suggested strategies and comment on the Task Force presentation.

The Politicians will adopt those measures they feel are most promising.

TASK FORCE MEMBERS:

Politician Members
Planner Representatives
EQA Representation Coordinator
Developer Representative
Industry Representative
Citizen Representatives

REFERENCES:

Environmental Law and Policy, Krier, Bobbs-Merrill.

Environmental Law, Reitz, North American International.

## STEP EXERCISE EXAMPLE

## HEARING ON ENVIRONMENTAL IMPACT REPORTS

## REQUIREMENTS & IMPLICATIONS

OBJECTIVES:

The objectives of this STEP are to explore typical State Environmental Quality Act requirements for Environmental Impact Reports and the impact of EIRs on local jurisdictions, public agencies and private interests. The participants will be provided the opportunity to consider the possible effects of the EIR on current development trends and controls, i.e., land use patterns, industrial development, growth control, zoning policies, existing master plan implementation, etc.

BACKGROUND:

On January 1, 1970 the President signed into law the Federal National Environmental Policy Act (NEPA). This act requires that each federal agency prepare an "environmental impact statement" on any proposed major action which might significantly affect the quality of the environment. These "statements" are to be detailed reports which assess, among other things, the certain and potential environmental consequences (both adverse and beneficial) of 1) implementing the proposed action or project, 2) implementing alternative actions or projects, and 3) not implementing the action or project.

Some important aspects and consequences of NEPA are:

1. The environmental consequences of an action must be assessed prior to initiating the action.

2. The assessment must be made public and a discussion of any objections or comments by other federal, state and local agencies, private organizations and individuals must be included in the final impact statement.

3. The act implies and the courts have upheld the rights of citizens and interested groups to bring suit to delay or halt a project on environmental grounds.

4. The intent of the term "environmental impact" is being broadened to consider not only physical effects of an action but to include adverse effects on living beings and to include adverse growth inducing impacts.

Following this federal lead, the state in which APEX County is located has passed a similar law titled the State Environmental Quality Act (SEQA). This act requires that all projects (with certain exceptions) which may have a significant effect on the environment and which involve a discretionary governmental action will require the preparation of an Environmental Impact Report (EIR). Projects include actions to be carried out by a public agency or non-governmental (private) actions which require governmental approval or other governmental involvement. The EIR is to be prepared by the public agency which is the "Lead Agency."

Definitions of the above terms and guidelines for preparing EIRs have been issued by the state (Reference 1). Local city and county agencies now have responsibility for preparing EIRs for projects which fall under their jurisdiction. Since they are not yet "geared-up" to perform this function the County Board and City Council have asked their Planning Staffs (in cooperation with the EQA) to prepare a joint presentation explaining the implications of this new requirement. The Politicians are interested in such questions as:

1. What projects need an EIR?
2. Who decides what projects need an EIR? How?
3. What must an EIR contain?
4. Who specifically prepares the EIR?
5. How is an EIR evaluated?
6. What criteria is used to approve or reject an EIR project?
7. How will the requirements for EIR's affect the current practice of land use control by zoning?
8. How will EIR affect the APEX County Master Plan implementation?
9. How will EIRs affect public and private (land development, industrial) growth and development patterns?
10. How can EIR preparation and evaluation be structured to give some assurance that a minimum of conflict dissension and law suits will result?
11. Other questions they may ask.

The Politicians have called an open hearing for the Planners presentation. The Politicians welcome the attendance and participation of all concerned parties, public and private.

REFERENCES:

Guidelines for Implementation of the California Environmental Quality Act of 1970.

In Productive Harmony, Environmental Impact Statements Broaden the Nation's Perspectives, EPA-335, September, 1972.

A Citizen's Guide to Clean Air, Conservation Foundation, January, 1972.

Lack of Impact by Frank Kreith, Environmental Magazine, February, 1973.

## STEP EXERCISE EXAMPLE

## IMPACT STATEMENT HEARING

## PROPOSED FREEWAY CONSTRUCTION

OBJECTIVES:

The objective of this STEP is to create a setting in which the participants may consider the legal requirements and the economic, social and environmental impact of a major proposed transportation project.

The STEP will allow them to:

1. Investigate and consider the numerous consequences that such a project may produce.
2. Become familiar with the federal legal requirements for such impact statements.
3. Become familiar with typical state and local requirements for such statements.
4. Prepare and present an impact statement in an open hearing in which typical community leader, special interest group and citizen reactions can be experienced.

BACKGROUND:

The National Environmental Policy Act (NEPA) of 1969 (P.L. 91-190, Section 102) contains a requirement that federal agencies file an "environmental impact statement" on any "major federal actions significantly affecting the quality of the human environment." Following this lead, some states have passed Environmental Quality Acts with state requirements for similar statements. This procedure for considering the primay and secondary consequences of new and existing projects is now "trickling down" to the local community level. This has resulted in some local and regional jurisdictions requiring studies and reports on environmental, social and economic consequences of projects as contributions to their decision-making process on approval and/or support of those projects.

THE ISSUE:

St. Joseph's Connector Freeway Construction Contrary to previous agreement between the State Highway Department and APEX County officials, the state has decided to begin immediate construction on the St. Joseph's Connector which would route a major freeway through downtown APEX. The County Council at the direction of the Board of Supervisors has submitted a petition for relief to the Superior Court and obtained a temporary injunction to delay initiation of the construction pending a full hearing on the merits of the case.

The County Board in cooperation with the City Council has appointed a special St. Joseph's Connector Review Committee consisting of prominent leaders of the community and including citizen group representation. Since this project is in conflict with the APEX Master Plan and is opposed by some segment of the community, its committee will conduct hearings to determine the adverse and/or beneficial effects of construction of this freeway link on all segments of the community. The committee will solicit professional and lay opinions on the social, economic, and environmental impact of the project.

The Environmental Quality Agency, in conjunction with the Regional Planning Department has been requested to prepare an impact statement and to appear before the committee and present their views on the project's effects. Other community leadership, special interest groups and interested citizens may participate.

ASSIGNMENTS:

Chairman of the Meeting
Hearing Board Members
Environmental Quality Agency (Environmental Impact)
APCO Staff
Regional Planning Department
City Planners
Industrialists, Developers, Citizens, etc.

# CHAPTER 8

## Chapter 8

## ADDITIONAL INFORMATION

In this section of the manual the Game Overall Director will find supplemental material that from past experience has proven to be helpful for the running of the METRO-APEX game. Please remember these are optional and may be used as GOD sees fit. GOD may wish to put this section into a loose-leaf notebook to keep any additional forms or documentation that he may find useful for the processing of the game. Enclosed you will find the following:

I. Rules for the Game. This is passed out to all participants of the game and specifies what constitutes a public hearing, who is required to have a public hearing, grant applications, trials, etc.

II. The Continuing Crises in APEX County. This is a quick and dirty scenario describing the current situation in the county. This can be modified by GOD to set the proper initial conditions for the game. This is handed out to all the participants.

III. Master Plan for APEX County. In the past suggestions have been made to start the players off with a Master Plan for the county, albeit it may not be the best. This is usually handed to the Planners and Politicians.

IV. Exofirm Sheet. This is a sheet that can be used by GOD to keep track of where the different exofirms might be locating. There could be as many as 15 different players trying to get an exofirm into different AA's of the county. At the end of the cycle GOD can designate the most desirable location based upon the results of these forms.

V. METRO-APEX Questionnaire. At the end of every game it is extremely helpful both for the players as well as the staff to evaluate the success of the game. As a tool for aiding this process, a sample questionnaire is presented.

VI. METRO-APEX Problems. This is a form that we use whenever we run across a problem with the game. By documenting the problem immediately while it is still fresh in your mind, it is much easier then to solve the problem between games.

VII. Strategies of Power, Persuasion & Reduction. A useful little handout that might be given to any role or player who might be floundering and not actively involved in the game.

VIII. Court Summons. Often a person is asked to appear in court. This might be a useful form to not only get people to appear but also in the scheduling of your trials.

IX. APEX County Impact Statements. Since both the federal government, most state governments and now many county governments require environmental impact statements, this particular form is quite handy to use. However, the criteria for who fills out this form, for what type of projects, who shall review these forms, etc. may make an interesting STEP Exercise.

X. Rules of APEX County. It is often helpful to give the Air Pollution Control Officer a starting set of rules setting the emission standards for APEX County.

XI. Permit Application. Some groups have based their new rules of compliance in conjunction with a permit system. This form is currently given to the APCO but can quite easily be modified for any other role.

XII. Transportation Options. If there were a desire to include in the game the role of Regional Planners with a group interested in transportation palnning, we have included the makings of a mini-manual for that role. A replacement to Chapter 3 has been included defining the duties of this new role. Also enclosed is a list of additional transportation capital improvement projects and special programs.

XIII. Grant Application Form. This form may help the Game Overall Director to keep track of the funds that he has allocated to the different groups in the game. On this form he can ask the players to justify the proposals, how the money will be spent, etc.

# I. METRO-APEX

## I. RULES FOR THE GAME

A. Ten minute notice, plus public announcement for all public hearings (use blackboard).

B. All EQA, City and County Politician budgets must be voted on in a public hearing.

C. All rezoning must be voted on in open hearing.

D. Requests for state or federal funds must be written and should contain specific amount requested, local support (if any), justification for request, name of requesting agency, cycle number, time and signatures of requester and granting authority.

All state and federal fund requests must first be approved and signed by appropriate local government body (City or County Politicians).

E. Industry must be notified at the time a plant inspection, emission measurement or effluent sample is ordered by EQA, APCO, WQM.

F. All trials, summonses, etc. must be dated, signed and cleared through Judge.

## II. LOGISTICS

A. All game activity will be in the game room.

B. All requests for XEROX and typing should go through role advisor.

# II. BACKGROUND

## THE CONTINUING CRISES IN APEX COUNTY

APEX County exhibits many of the current trends and problems of America's urban areas. Some of these are:

1. A city with a deteriorating central core occupied primarily by poorly housed people who (a) have low incomes, (b) have a low level of skills, (c) are aged, (d) are unemployed, and (e) want to move out.

2. A flight to the suburbs (by those who can afford it) with accompanying urban sprawl and "helter skelter" development.

3. Industry is largely downtown and thus workers from the suburbs commute daily by private automobile causing congestion and pollution.

4. No adequate public transit system exists.

5. Pollution in the Central City by far exceeds those levels necessary for good health.

6. A shortage of high quality (clean burning) fuel is predicted for next year.

7. If industry cuts back its fuel usage, more unemployment and fewer taxes will result.

8. Industrial growth might provide jobs and taxes but cause more pollution and congestion.

9. Inadequate resources and disagreements about the proper methods for solution to these problems have caused a "stalemate" up to this time-- much talk but little effective action.

10. The conditions in the Central City are getting worse year by year.

11. GO BACK TO 1.

(The Planners, Environmental Quality Agency and other roles have more specific data on the above general trends.)

## III. MASTER PLAN FOR APEX COUNTY

Apex County Regional Planning Commission

Central City, APEX County

LIST OF CONTENTS:

A. Background for APEX County Planning
B. Issues facing APEX County
C. Plan for APEX County
D. Action: Modes and Tactics for Implementation

PREFACE

The APEX County Regional Planning Commission was established by the state enabling legislation for regional planning. Its primary objective is the consolidation of planning efforts across the spectrum of the needs facing the rapidly expanding county of APEX. The funding for this original planning effort came from a cooperative venture by federal, state, and county-city agencies. The motivating force behind the creation of the Regional Commission was the growing awareness that man's continued livelihood on the planet earth hinges on efficient stewardship of ever decreasing resources, and that to exercise such control requires the cooperation on a scale equivalent to the scope of the problems and issues being dealt with.

ACKNOWLEDGEMENTS

The APEX County Regional Planning Commission gratefully acknowledges the cooperation of interested citizens, public minded scholars, and concerned Politicians in the preparation of this document. We hope that this is more than just a plan, rather a practical guide-book to the future of APEX County.

A. BACKGROUND FOR APEX COUNTY PLANNING

Long before the white man or even the American Indian lived in this area, the entire region was covered with a glacier which scoured the land and changed its formation. The last withdrawal of the glacier left deposits of sand, gravel and rubble over the entire area. The geographic evolution is significant to the region in the supply of subsurface water and in the location of gravel and clay deposits.

Farming potential was the primary attraction for the white settlers. Since the land had to be cleared for farming, lumbering also became of major importance to the economy and encouraged more people to settle in the region.

The first settlement in the APEX County region grew around a trading post located near Maple Rapids in 1826. In the 1830's, the agricultural potential began drawing more settlers to the area. Other industry accompanied the lumbering industry when portable saw mills and grist mills for milling flour were located along some of the rivers.

Several settlements were established in the area by 1840, and by 1880 there were a number of them scattered over the region. Many of the settlements that had prospered on a lumbering economy began to disappear as the economic activity developed around the state government, the college, and new industries. In the late 1880's, the automobile came to APEX County and

exercised its influence on the economy of the county. During the first half of the twentieth century, the economic activity of the area grew steadily in both agricultural and commercial production. This highly productive economy was reflected in an expanded population, growing towns and spreading transportation systems. This expansion has developed to the point where today no community is completely independent of other communities in the region, as many communities have come together physically and are socially and economically interdependent.

The area today is a highly complex arrangement of places and people in need of services, work and areas for recreation. The people have travel demands as well, as daily business is conducted both within and without the county. The governmental structure is a complex organization of counties and seventy-five other units of government, including townships, villages and cities. In addition to the effects of political units, there are influences exercised by the state and federal systems.

The people of the region are one-third of a million with varying age characteristics thattare influenced strongly by the student population at the State University. In the urban areas of the region, there are 288,300 people which is 84.2% of the total population and 53,925 persons or 15.8% of the total living in the non-urban or rural areas of the region.

Seeking to meet the challenges of today in the rapidly growing county are the highly complex political units and a population of changing composition. Since more individuals live closer together in communities, it is evident that higher health standards and better safeguards are required. This urban expansion calls for better community facilities, including expanded and adequate public utility systems. The facilities are needed to cope with the problems now becoming more apparent in the development cycle.

In the pursuit of economic achievement, natural resources have been badly depleted, with no regard given for conservation. Increased developmental pace has created a need for the more efficient use of these every day scarcer commodities. It is undisputable that adequate provisions for safe water and the safe disposal of solid wastes must be made before the increasing densities compound the problems already occurring. The increasing costs of such provisions make even more apparent that the tasks of planning and providing for the urban community of today are no longer within the independent reach of the single go-it-alone urban center.

Change is one of the basic characteristics of the modern world, and urbanization is one of the most important and far-reaching aspects of this change. No nation, no state, and no region which participates in modern life can escape this increasing urbanization; and no part of daily life can avoid being influenced in some way by the forces rooted in this complex process. Since population growth and urbanization appear inevitable in the absence of some worldwide disaster, the question facing public officials and citizen leaders within the region is not whether such growth and urbanization will occur, but how much will occur and how well it will be shaped and guided in the public interest.

Rational growth is ultimately the result of changes in population size and composition. As more and more poeple move to urbanizing areas, increasing needs are generated for various urban services and facilities. As income and educational levels rise, the needs and desires of the population also change. A realistic and desirable plan for the future state of the area must, therefore, reflect the needs of the people concerning their environment and social, economic and physical welfare. The following plans and forecasts are based on the simple principle that it is people and not "things" that are the basic measure of growth and development. Moreover, it is only through understanding the amount and character of this population growth that plans can be formulated to guide future development into more orderly and desirable forms.

## B. ISSUES FACING APEX COUNTY PLANNERS

### 1. POPULATION

The total population of the county is expected to increase significantly over the next twenty-five years. It is expected that over a quarter of a million additional people will establish residence in the region between 1965 and 1990. A proportional amount of these will settle in APEX. The expected net population increase for the area will be in the range of 72%.

| Year | Population | Percent | | Year | Population | Percent |
|---|---|---|---|---|---|---|
| 1900 | 46,315 | --- | * | 1960 | 194,085 | 22.4 |
| 1910 | 51,864 | 10.7 | * | 1965 | 227,000 | 14.5 |
| 1920 | 77,747 | 25.7 | * | 1970 | 261,277 | 15.1 |
| 1930 | 109,042 | 28.7 | * | 1975 | 291,846 | 11.7 |
| 1940 | 150,610 | 11.0 | * | 1980 | 323,657 | 10.9 |
| 1950 | 194,085 | 27.6 | * | 1985 | 357,964 | 10.6 |
| | | | * | 1990 | 391,970 | 9.5 |

*Issues surrounding population growth and urbanization:

-There is little accomplishment in the face of today's urban expansion, to properly mesh growth with land use and zoning.

-The county faces considerable difficulties in coordination and control of the growth patterns on a wide enough basis to be truly effective. The present trends in growth are uncoordinated, costly, and in the foreseeable future will lead to inadequate safeguards to health and welfare of county residents, as well as ultimate decay and urban blight.

-The existence of widespread, incompatible land development, in-

adequate balance of housing types, congestion and the inaccessibility of proper recreational facilities, jobs, and educational opportunities are bound to compound on the county as well as on a regional basis unless concerted effort is devoted to cooperation and coordination among all levels of political jurisdiction.

2. TRANSPORTATION

Over the next twenty-five years, there will be significant changes in both the form, the needs, and the intensity of the transportation requirements for APEX County.

Cars Available:

| | |
|---|---|
| 1965 | 51,480 |
| 1975 | 66,960 |
| 1990 | 92,000 |

Trip Purpose:

| Trip Purpose | % 1965 | % 1975 | % 1990 |
|---|---|---|---|
| Home-Based Work | 13.9 | 13.0 | 12.7 |
| Home-Based Personal Business | 7.3 | 7.0 | 6.8 |
| Home-Based Recreation-Social | 10.5 | 10.5 | 10.5 |
| Home-Based Shop | 11.1 | 11.0 | 10.8 |
| Home-Based Other | 16.3 | 16.6 | 16.9 |
| Home Based Totals | 59.1 | 58.1 | 57.7 |
| Non-Home-Based (Except Heavy Truck) | 36.7 | 36.1 | 35.7 |
| Heavy Trucks | 2.6 | 2.9 | 3.1 |
| Through Trips | 1.6 | 2.9 | 3.5 |
| Total Trips (Numbers) | 298,390 | 401,120 | 560,800 |

*Issues and problems surrounding transportation planning:

-The present network of streets and highways, airports, rail facilities and bus routes has not been considered in a comprehensive manner. The inter-meshing of the various options in terms of mass transit, mixed media travel (car-bus-destination), etc. with the existing growth of automobile use in the suburban localities has not been considered or allowed for.

-All the region's residents do not have equal opportunity to travel to all points of the county or the region. Significant numbers of the population do not have adequate accessibility to jobs, schools, parks, shops and medical facilities.

-The present system of transportation fails to afford the highest degree of safety possible to pedestrian, air and ground traffic movements.

-Inadequate allowances for transportation-land use relationships have contributed substantially to the region's present traffic problems. Consideration has not been given to turning movements, on-street parking in strip commercial areas, the blighting effect of major traffic arteries, or local residential service streets used for high volume traffic.

3. HOUSING

The growth in the net population of the county, along with the changes in the distribution, type, and age-income of these county residents will increasingly compound the already drastic needs for the provision of adequate and varied housing options. A substantial demand for new housing during the late 1960's and early 1970's will probably follow the increase in per capita incomes and a marked increase in young persons reaching marriageable age. Significant amounts of this housing will probably be built in the fringes of existing urban areas. The single-family house will likely remain a preferred housing choice. However, the presence of more young adult and senior citizens in our society, individual financial limitations, and increasing land and development costs will increase the demand for townhouses, apartments and other forms of multiple unit development.

Approximately 29,155 additional households will be needed to house the county's residents by the year 1990. This represents a 74% increase in households over the 1965 totals. (See the summary chart on the following page.)

By 1990, approximately 19,940 additional acres of land will be required for county development. The additional acreage will

be needed to satisfy the new land demands generated by an expanding population and increasing economic activities. In addition to expected higher residential densities, it can be expected that proportionate increases will occur in commercial and industrial acreages to meet the needs of this expanding economic activity.

DEVELOPED LAND SUMMARY IN ACRES

| | 1960 | 1965 | 1975 | 1990 |
|---|---|---|---|---|
| Residential | 27,080 | 30,920 | 37,910 | 47,940 |
| Commercial | 1,870 | 2,160 | 2,990 | 3,580 |
| Industrial | 3,180 | 3.300 | 3,800 | 4,600 |
| Recreational | 12,980 | 13,330 | 19,460 | 26,400 |
| Street R.O.W. | 34,090 | 37,600 | 41,110 | 48,320 |
| Other | 7,150 | 7,340 | 8,880 | 9,860 |
| Total Developed | 86,350 | 94,550 | 114,150 | 140,700 |
| Total Undeveloped | 1,013,150 | 1,004,950 | 985,350 | 958,800 |

4. EMPLOYMENT AND INCOME

Improved technology and automation are expected to increase the productive efficiency of workers and reduce the proportion of industrial jobs to total jobs available in the future. The non-manufacturing segments of the economy will experience an increase in employment and will provide in 1990 63.8% of the total county employment, an increase of 4.6% over 1960. By 1990, 30,470 new job opportunities will be available in the county. This represents an increase of 62.0% in total APEX County employment over the 1965 level of 55,800.

EMPLOYMENT SUMMARY TABLE

| Employment Type | Percent of Total (1965) | Percent of Total (1975) | Percent of Total (1990) |
|---|---|---|---|
| Agricultural | 3.9 | 2.4 | 1.4 |
| Manufacturing | 36.9 | 36.0 | 34.8 |
| Services | 14.1 | 15.0 | 15.0 |
| Government | 23.6 | 23.5 | 24.4 |
| Retail | 13.4 | 14.1 | 13.9 |
| Other | 8.1 | 9.0 | 10.5 |
| Total (Percent) | 100.0 | 100.0 | 100.0 |
| Total (Job Numbers) | 55,800 | 67,400 | 86,270 |

The median family income of the APEX County residents according to the 1960 census, was $6,177 per year. Trends indicate that higher disposable incomes will be available for each family in the future. Increased future incomes will tend to change consumer buying habits. Family expenditures for such basics as food, clothing, and beverages are likely to decrease proportionately, while the amount of income devoted to medical care, travel, recreation, housing, transportation and education will probably increase.

The median county income, by family, is expected to rise from $7,047 in 1965 to $15,000 by the year 1990, as measured in 1959 constant dollars. This represents an increase of 119% over this twenty-five year period.

*Issues facing county planning in reference to housing, employment and family income:

-As the press of certain growth creates the demand for shelter, there is neither an adequate balance of housing types, a variety of densities, nor an integration of the housing supply for all economic levels.

-Within the county, at both the urban and non-urban levels, there is the occurrence of blight, obsolescence and deterioration of structures which creates undesirable health, safety and general welfare conditions.

-There is little or no coordination between the industrial, commercial and other job creative development, and the placement of prime residential zoning. Access to recreational facilities is equally handicapped for residents of certain areas.

-The changes in income patterns, age distribution, housing type preference have not really been considered in the future planned for APEX County.

-The location of residential areas presently does little to ease the burden on the roadways created by the heavy and unorganized commuter patterns; work-travel trips made by county residents represent 16.6% of all the average weekday vehicular trips in APEX County. A majority of these trips are made during peak traffic periods when congestion is greatest. In 1960 there were 59,331 workers living in the region outside Central City, but working in and around APEX County. Of these workers that lived outside Central City proper, 43% or 25,795 persons commuted into the city for work purposes. By 1965, the numbers in this category had increased to represent 53%, or 31,862 workers. At the same time, in the neighboring counties, the percentages of people living and working in the same county decreased from 54% to 43% in BPEX County, and from 59% to 42% in CPEX County.

As employment facilities grow and new ones are added, employment in the smaller centers of the region is expected to increase. Even though employment growth in the smaller centers of the area is anticipated, the central community will continue to be the largest center of employment. This will hold true as reduced travel times between the regional centers will stimulate residential growth in these communities.

Means of getting to work:

| | |
|---|---|
| Auto passenger | 19.1% |
| Bus | 1.0% |
| Other | 0.5% |
| Auto Driver | 79.4% |

(Source - 1965 Home Survey)

5. EDUCATION

The demands of new and different technology will require higher levels of formal education; the average number of school years completed will continue to increase and college enrollment rates will increase sharply during the late 1960's and early 1970's, as the "war babies" reach college age. An expected increase in the number of young children will require expanded primary educational facilities. The new skills needed for a "space age" will demand additional adult vocational skills and training. In the late or middle 1970's trends indicate a reorientation of the type and style of the education sought, away from the purely academic as the market for such skills is saturated, and towards increasing emphasis on the vocational and job oriented training subjects.

Number of School Years Completed:

| | |
|---|---|
| 1940 | 10.4 |
| 1960 | 12.0 |
| 1975 | 13.0 |
| 1990 | 14.0 |

*Issues and problems facing education planning:

-In the face of ever-increasing technology and in an era of specialization, it becomes increasingly important that all levels of education be provided within the physical and economic reach of all the citizens of APEX County.

-School service areas are not established to afford equal opportunity for similar education to all residents.

-There is not adequate awareness of the need and responsibility to finance special technological schools to keep in step with the changes in all fields of endeavor, or to meet the upcoming needs in manpower for the county.

-A growing need for a Junior College to provide the services mentioned above.

6. ENVIRONMENTAL QUALITY

The quality of the environment in APEX County should be one of the highest considerations in a master plan. The pollution of our environment has gone on unchecked since the formation of this community, and it still is continuing as our growth increases further. The quality of our air and water need an immediate improvement on a scale which will bring APEX County a healthy environment in five years. If we wait any longer there may be no way to improve our air and water beyond unacceptable levels.

*Issues and problesm facing environmental quality planning:

-The question of how much growth the county can tolerate without going over the county's carrying capacity of people and pollution must be confronted and answered. It is proposed that growth (people, industry, etc.) not go beyond 4% per year;

-Industries in APEX County must come into acceptable air and water quality standards within four years;

-New industries coming to APEX County are necessary for improvement of the tax base and for new jobs, but they must be of a non-polluting type;

-Environment Impact Reports must be filed for all new substantial projects (public and private) and then approved by the responsible local agency.

-A pattern of controlled growth, pollution clean up and environmental quality maintenance should be implemented immediately.

C. PLAN FOR APEX COUNTY

As changes occur in the giving of county characteristics, the pressures and needs for rational planning of a comprehensive nature, that will take into account and distribute the every-day scarcer natural resources and optimize the human benefits, becomes even more critical. This plan is an attempt to do just that; begin to exert a concerted effort towards coordinating the multidimensional aspects of county and regional level planning.

1. PLAN PURPOSES

-To help guide the changes occurring throughout the region
-To make change truly progress
-To prepare the total county for dealing with the existing and future problems of a rapidly growing region
-To help solve the crucial problems created by population growth

2. GOALS FOR APEX COUNTY

-A broad range of employment opportunities
-Efficient and economical use of land
-Renewal of obsolete areas
-Orderly growth and development
-Preservation of open space and expansion of recreational opportunities
-Efficient transportation of people and goods

3. PLANNING POLICIES

-Economy and efficiency in providing adequate, healthful and convenient community services
-Encouragement of aesthetic and social amenities
-Transportation facilities with provision for adequate access to all points of the county
-Provisions for future parks and open space in keeping with population and age group changes, leisure time availability, mobility characteristics
-Natural resources be utilized for their highest and best use
-Sewage systems of the region be integrated with a comprehensive water management program to insure a high standard of performance and maintenance of health standards
-Availability of a wide range of housing types within sound neighborhood developments
-Consideration of long range political and economic ramifications of regional growth and change

4. THE PLAN

a. Open Space and Parks:

The primary parks and recreational system will follow the course of the river through APEX County. The scope of this parks system should be a narrow band through the AA's 5, 8 and 10, with larger full size parks in AA's 27, 14, and 11.

b. Transportation:

1. Long range planning required for the conflict free construction of the St. Joseph's Connector (East-West).

This should be done in conjunction with the housing development in AA's 13 (South) and 23(North/East).

2. Increase governmental involvement in mass transit, particularly at present, the elaboration of bus line coverage to suburb and AA's 13, 23, 24, 22, and 27.

3. Eventual blocking off of access to central 4 to 8 block areas in AA's 8, 4, 6, and 7 to form pedestrian only malls, with all service facilities such as parking, mass transit access from all points in the county, etc.

4. The creation of another international airport within the next five years. This should then be linked with an expansion of convention and tourist attracting facilities. A tentative location would be South-Eastern AA 29 or South-Western AA 14. Easy access to both the central commercial area and future recreational zoning around Lake AA 14 makes this area ideally suited to such development.

5. Arterial connectors between existing interstate freeways and the South of AA 27, the center of AA 22 and the North-West of AA23; these should be designed with carrying capacities at the "heavy-truck" level, to handle future industrial development.

c. Housing:

1. The blight gradually threatening city center should receive concerted study at a regional level. Future residential growth should be channeled towards AA's 13 (South), 23 (North), 24 (All) and in the northern section of the county, AA's 28 (South-East), and 25 (All). On the long range of two decades, moves to refurbish the rapidly deteriorating core of the city should include:

2. The creation of a "Housing Authority" to handle the socio-economic implications of displacement and relocation.

3. Future industrial growth to occur in "park" form, coordinated with rail right of ways, the highway construction that would encourage the location of new medium to heavy industry in AA's 22 (Center), 23 (North-West) and 27 (South). Infra-structure needs for water, power, sewers, etc., should be initiated immediately through appropriate projects.

4. A belt of R-1, R-2 and R-3 housing should be encouraged at the boundary of AA's 13 and 23 in view of handling increment to the county population as well as displacement. From the core area, density should be stringently held down and the planting of rapid-growth trees encouraged in these areas.

5. As existing facilities are vacated or condemned in the core ghetto, new construction should be limited to M-1 and density criteria stringently enforced. Further study is required to establish the above mentioned "Density Criterion." These should be a high priority item on future planning needs.

d. Education:

1. The shift in patterns of educational needs demands a realignment of resources. Future planning for education should emphasize:

-Decreased spending in university level, academically oriented facilities, and creation of a decentralized network of smaller sized junior college level institutions
-Course work should be shifted towards vocational and skills oriented training.

2. Long range studies should be made to:

-Match expected job required skills to expected job market
-Coordinate to this end the relationships between existing industry-commerce, and the existing educational system. Such coordination should have the following objectives in mind.

a. Match training to needs at market level. Broaden the support base of the educational system among the industrial-commercial sector in the form of "on-the-job training," educator drawn from non-academic ranks of experienced, industrial personnel, etc.

b. A feedback system to continually update curriculum needs to match changing market requirements.

3. Working hand in hand, the motto of such an effort could be "A job for every graduate of the APEX County Educational System."

D. IMPLEMENTATION - "A PLAN FOR AND IN ACTION"

The impact of regional planning entails the cross-jurisdictional application of its sanctions. In order to aid and abet such implementation, we of the Regional Planning Commission encourage the rapid development of a "Council of Governments" to mediate between political jurisdictions. A full survey should be made of all options for the future funding of these proposed developments, including the soliciting of increased private sector participation such as "Project Cost Sharing" by Industry and Developers. Infra-structure costs, (road ways, sewers, etc.) should be equally borne by all affected parties.

IV.

Initiated By: _____ Cycle #_____

EXOFIRM PREFERRED LOCATION

This is to certify that all conditions indicated in the METRO-APEX News have been satisfied and Exofirm Number _____ is to be located in Analysis Area _____. When applicable, the DEVELOPER has invested $_____ in this Exofirm and the POLITICIANS have spent $_____ on Project Numbers _____ _____ _____ _____ and/or have approved the necessary rezoning ( ) ( ).
Yes No

Politicians' Signatures

_____

_____

_____

_____

_____

## V. METRO-APEX QUESTIONNAIRE

University of Southern California, School of Public Administration
COMEX Research Project, Los Angeles, California 90007

---

PLAYER PROFILE

1. Name (optional) _____

2. What role did you play? _____

3. Have you played METRO-APEX before? Yes _____ No _____

4. Age _____

5. Educational Background:

| Major Academic Subject | Institution | Degree Earned | Date |
|---|---|---|---|
| | | | |
| | | | |
| | | | |

6. Occupation:

| | Title | Years in Position | Name of Organization |
|---|---|---|---|
| Current | | | |
| Previous | | | |

7. Current involvement/responsibilities in environmental activities or pollution control.

The following questionnaire is divided into three parts. Please answer questions in Parts One and Two by circling the appropriate rating to indicate your agreement with the question. Extra sheets are provided at the end if you have additional comments.

The following code is applicable for Part I.

(1) Agree Strongly
(2) Agree Somewhat
(3) No Opinion
(4) Disagree Somewhat
(5) Disagree Strongly

Part I

| | | (Circle One) |
|---|---|---|
| 1. | The interactions among roles is an effective representation of real world interactions. | 1 2 3 4 5 |
| 2. | Playing METRO-APEX should facilitate communication among individuals with divergent backgrounds. | 1 2 3 4 5 |
| 3. | Most of the important strategies necessary to effectively play my role were available to me within the constraints of the game. | 1 2 3 4 5 |
| 4. | METRO-APEX seems to be a game that is only beneficial to individuals involved in air pollution control. | 1 2 3 4 5 |
| 5. | Playing METRO-APEX should increase most people's comprehension of the interrelationships among various segments of a "real life" community. | 1 2 3 4 5 |
| 6. | The types of decisions required within the game had no relationship to the type of decisions individuals in similar roles in the "real world" would make. | 1 2 3 4 5 |
| 7. | My strategies and decisions became more sophisticated as the game progressed. | 1 2 3 4 5 |
| 8. | METRO-APEX is an effective teaching tool at the undergraduate level. | 1 2 3 4 5 |
| 9. | METRO-APEX is an effective tool at the professional graduate level. | 1 2 3 4 5 |
| 10. | Interactions with other players affected many of my decisions. | 1 2 3 4 5 |

Part II

How much do you think the following supportive information contributed to your comprehension and playing of METRO-APEX?

The following is applicable to Part II:

(1) Extremely Helpful
(2) Of Some Help
(3) No Opinion
(4) Of Little Help
(5) Useless

| | | (Circle One) |
|---|---|---|
| A. | Advisor Introduction (individual roles) | |
| 1. | Clarity | 1 2 3 4 5 |
| 2. | Content | 1 2 3 4 5 |
| 3. | Knowledge of role | 1 2 3 4 5 |
| 4. | Advisor assistance during play | 1 2 3 4 5 |
| 5. | Availability | 1 2 3 4 5 |
| 6. | Enthusiasm | 1 2 3 4 5 |
| B. | Written Materials | |
| 7. | Role Manuals | 1 2 3 4 5 |
| 8. | Computer Output | 1 2 3 4 5 |
| 9. | Worksheets | 1 2 3 4 5 |
| 10. | Maps | 1 2 3 4 5 |
| 11. | Newspaper | 1 2 3 4 5 |
| C. | Television | |
| 12. | News | 1 2 3 4 5 |
| 13. | Editorials | 1 2 3 4 5 |
| 14. | Specials by gamed players | 1 2 3 4 5 |
| D. | Film (Used on the 1st day introduction) | |
| 15. | Content (as overview) | 1 2 3 4 5 |
| 16. | Quality | 1 2 3 4 5 |

Part III

1. How successful do you feel you were in accomplishing your objectives and why?

2. If you had a chance to replay the last 2 cycles, what would you do differently?

3. Please give us your opinions of the STEP Exercises.

4. What additional STEPs would you recommend?

5. Did you feel that the strategies in the game were applicable to your real life role?

6. What other environmental issues or problems do you believe should be introduced into the game?

7. Did the game change any of your conceptual beliefs about Environmental Management?

8. Did you learn any new or innovative environmental management strategies within the game?

9. Would help from more university instructors or specialized experts be beneficial to the learning process within the game?

10. Where do you think a gaming simulation like METRO-APEX (perhaps with some role changes) would be applicable and valuable in your area of real life?

11. What improvements or changes would you make in the game?

12. Other comments pertaining to the game.

## VI. METRO-APEX PROBLEMS

DATE: _____ 360 _____

TEAM # _____ Cycle # _____ Other _____
(Please Specify)

TEAM IDENTIFICATION: _____

PROBLEM: Error Bugs _____ Manual Changes_____ To be Tried _____ Further Research _____

ROLE:

| | | |
|---|---|---|
| EQA _____ | Dev.#_____ | Newspaper _____ |
| APCO_____ | Central City Pol. _____ | Trans. _____ |
| WQM _____ | County Pol. _____ | Mapping _____ |
| SWM _____ | City Planner _____ | File # _____ |
| Ind.#____ | County Planner _____ | Other _____ |

Page Number _____

DESCRIPTION OF PROBLEM

_____

_____

_____

_____

RECOMMENDATION

_____

_____

_____

_____

PRIORITY _____

STAFF ASSIGNMENT _____ NAME _____

VII.

Strategies of Power, Persuasion, and Re-education

In order to achieve the goals you have set for your role, three fundamentally different influence strategies might be considered. These strategies are the use of (a) power, (b) persuasion, or (c) re-education, or some time-phased combination of all three. The following outline may assist you in applying these strategies:

A. The strategy of POWER refers to efforts to induce a desired behavior through the use of external rewards and punishments for the change target (i.e., those not necessarily derived from the new behavior itself). The three kinds of power* and their illustrated use are:

| Types of "Power" Efforts | Examples |
|---|---|
| Use of authority | Threaten or actually engage in court action or other legal pressure. |
| Exchange of valued objects | Bargain or make trades or "deals" or use "programmed" publicity; offer monetary or "political support," bribes, etc. |
| Use of physical force | Threaten or actually injure valued person or property |

B. The strategy of PERSUASION refers to efforts to induce a desired behavior by identifying the new behavior with the target's existing beliefs and values. The three kinds of persuasion and their illustrated use are:

| Types of "Persuasion" Efforts | Examples |
|---|---|
| Appeals to logic (logos) | "Action now will be in your long-run interest." |
| Appeals to values (ethos) | "It is immoral and irresponsible to continue your current activity." |
| Appeals to emotions (pathos) | Dramatically demonstrate harm of unwarted activity, e.g., introduce a dying lung cancer patient or a gasping emphysema patient to influence air pollution regulations. |

C. The strategy of RE-EDUCATION refers to efforts to induce a desired behavior through the change target's internalization of new beliefs and values. The two kinds of re-education and their illustrated use are:

| Types of "Re-education" Efforts | Examples |
|---|---|
| Belief-modification | Provide data regarding severity of a current problem. |
| Value-modification | Increase perceived significance of the value of the health and welfare of APEX County residents relative to the value of personl wealth derived from profits. |

*Adapted from materials developed by the New England Consortium for METRO-APEX role descriptions which, in turn, credits the source:
Robert Chin and Kenneth Banne, "General Strategies for Effecting Changes in Human Systems," The Planning of Change, second edition, edited by Bannia, Banne and Chin. New York: Holt, Rinehart and Winston, 1969, pp. 32-69.

IX.

Cycle # _____ Initiated by: Role_____

Name_____

APEX County Impact Statement*

(Estimated Environmental, Economic, Socio/political effects of proposed project)

Name of Plan or Project: _____

Objective of Plan/Project: _____

_____

Effect of plan not being initiated: _____

No. households project type:

1. _____ 3. _____ 5. _____
2. _____ 4. _____

No. people displaced: _____

Relocation costs _____

No. businesses displaced _____

Relocation costs _____

Parks, historical and/or unique physical features destroyed or degraded:

_____

_____

Aesthetic impact: _____

Recreational impairment and/or enhancement: _____

_____

Industrial impact: _____

_____

Employment impact: _____

_____

Health & safety impact: _____

_____

Effects on flora & Fauna: _____

_____

Solid waste generation/disposed impact: _____

_____

Air quality impact: _____

_____

Water quality impact: _____

_____

Noise impact: _____

_____

Changes in traffic: _____

_____

Expected pressure group support/opposition: _____

_____

Civil rights: _____

Good Government League: _____

Chamber of Commerce: _____

Unions: _____

Ultra-Conservatives: _____

Cultural pattern/neighborhood impact: _____

_____

Economic growth stimulus/depressant: _____

_____

Community economic benefits/losses: _____

_____

Tax base effects: _____

_____

Municipal services load changes (type & $): _____

_____

Elete Support:

IND. _____, C. POL. _____, CO. POL. _____

EQA _____, DEV. _____, C. PLAN. _____

CO. PLAN. _____, STATE _____, FED. _____

* Required for all projects which may have a substantial "certain or potential" environmental impact and for which federal funds (NEPA, P.L. 91-190; 102) and/or state funds (1970 NEPA Act) are requested.

# X. RULES OF APEX COUNTY

## Rule 1. Title

These rules shall be known as the rules of the Air Pollution Control District.

## Rule 2. Nuisance

A person shall not discharge from any source whatsoever such quantities of air contaminants or other material which cause injury, detriment, nuisance or annoyance to any considerable number of persons or to the public or which endanger the comfort, repose, health or safety of any such persons or the public or which cause or have a natural tendency to cause injury or damage to business or property.

## Rule 3. Ringelmann Number

A person shall not discharge into the atmosphere from any single source of emission whatsoever any air contaminants for a period of five consecutive minutes in any one hour which is:

a. As dark or darker as that designated as No. 2 on the Ringelmann Chart, as published by the United States Bureau of Mines, or

b. Of such opacity as to obscure an observer's view to a degree equal to or greater than does smoke described in subsection (a) of this rule.

## Rule 4. Particulate Matter

A person shall not discharge into the atmosphere from any source particulate matter in excess of 40 pounds per hour.

## Rule 5. Sulfur Dioxide

A person shall not discharge into the atmosphere from any source sulfur dioxide in excess of 200 pounds per hour.

## Rule 6. Carbon Monoxide

A person shall not discharge into the atmosphere from any source carbon monoxide in excess of 10 pounds per hour.

Rule 7. Oxides of Nitrogen

A person shall not discharge into the atmosphere from any source oxides of nitrogen in excess of 140 pounds per hour.

Rule 8. Hydrocarbons

A person shall not discharge into the atmosphere from any source hydrocarbons in excess of 10 pounds per hour.

Rule 9. Inspections

Any air pollution control inspector has the authority to enter a plant for purposes of inspection of any equipment which he feels is in violation of this county's rules.

Rule 10. Fines

Any person who violates, disobeys, omits, neglects or refuses to comply with, or who resists the enforcement of any provisions of these rules shall be punished by a fine not exceeding five hundred ($500) dollars for each offense. Each day that a violation exists or is permitted to exist shall constitute a separate offense.

## XI. PERMIT APPLICATION

Application to operate or construct is hereby made by the undersigned in compliance with APEX County laws.

Firm Name: _____

AA Location: _____ Type of Industry: _____

I.

New application _____ Cycle _____ Initials _____

1st re-application _____ Cycle _____ Initials _____

2nd re-application _____ Cycle _____ Initials _____

---

II. APCO action:

New application Approve _____ Deny _____ Initials _____

1st re-application Approve _____ Deny _____ Initials _____

2nd re-application Approve _____ Deny _____ Initials _____

---

III. Appeal action (judge-air pollution hearing officer):

New application Approve _____ Deny _____ Initials _____

1st re-application Approve _____ Deny _____ Initials _____

2nd re-application Approve _____ Deny _____ Initials _____

---

APPROVAL UNDER II OR III ABOVE, CONSTITUTES PERMIT ISSUANCE.

XII.

Chapter 3

REGIONAL/TRANSPORTATION

Planners Role Description

A Regional Planning Department has been formed by agreement of the County Board of Supervisors and the City Council. The Regional Planning Department was created to facilitate the guidance and coordination of growth within the entire region of the County and City of APEX. In addition to its normal yearly operations, the Department is mandated to develop a Long-Range Comprehensive Master Plan. (This Master Plan will be presented to the County Board in a STEP Exercise.)

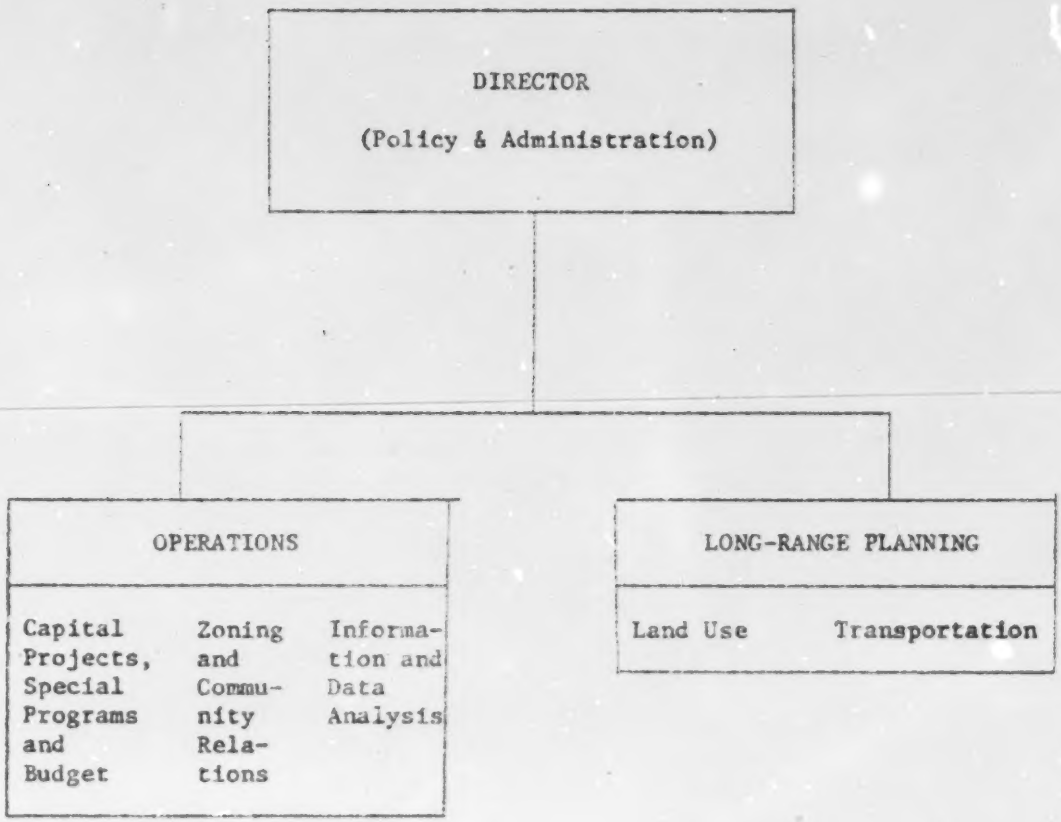
The Planning Department is headed by a director appointed by the County Board and serving at their discretion. Under the director is a Long-Range Planning Branch consisting of a Land Use Planning Office and a Transportation Planning Office. The Long-Range Planning Branch is occupied with advanced planning and the development of the Master Plan. The director has directed that the Long-Range planners be consulted by the Operations Branch to ensure that yearly project recommendations to the Board, rezoning request approval and exofirm locations are compatible with the long-range policy and Master Plan of the department.

The Operations Branch is responsible for preparing yearly Capital Improvement Project and Special Program Recommendations, recommending approval or disapproval of zoning change requests, providing liaison and services to the Politicians and other roles and conducting public relations activities to educate the public on the intents and desireability of the Planners' recommendations.

The Planning Department has the power to recommend, suggest, and convince; but all actual decisions on policy, rezoning, Grant Requests, budgets and project and program implementation is the responsibility of the County Board of Supervisors. The Planners may consult with departments of the State Government and the Federal Government, but all formal requests for financial aid to these agencies must be approved and signed by the County Board. A formal presentation must be made to the County Board in open hearing each cycle for consideration of the Planners' project and program recommendations to fund any consultant studies desired by the Planners and to pay for any desired TV or newspaper public education programs. TV time normally costs $1,000 per minute and newspaper coverage is $100 per line, but cost and coverage are at the discretion of the News Staff.

REGIONAL PLANNING DEPARTMENT

ORGANIZATIONAL CHART



County-wide Capital Improvement Project and Special Program recommendations must be presented to the County Board of Supervisors in open hearing each cycle for line item approval or rejection. The County Board of Supervisors and the Regional Planning Department (and/or the State and Federal Government in some cases) have responsibility for all county wide facilities, such as the airport, hospitals and major transportation routes.

The Central City Planners have the responsibility for Project and Program, rezoning, etc., recommendations to the City Politicians who have jurisdiction only within the city limits. Coordination and cooperation between the Regional Planning Department, City Planners, County Board of Supervisors and City Council will be at the discretion of the individual players. They also have the responsibility for all projects, programs and rezoning which are outside the Central City.

## Summary of Transportation in APEX County

The interstate highway freeway system in APEX County is shown on the map in Section 9. The freeways enter APEX County in Analysis Areas 28, 24 and 22. The west-east freeway segment enters Analysis Area 28 from the west, swings south around the southern boundary of Central City (AA's 12 and 13) and exits from Analysis Area 22. North-south freeway segments enter APEX County in Analysis Areas 24 and 22 and end in Central City Analysis Areas 3 and 19 respectively. The state highway department has been planning for several years to expand the freeway system in APEX County. Current plans call for initiating work on the St. Joseph's Connector which will exit east-west through the Central City (AA's 19, 7, 8, 4, 3) and into Township 1 (AA's 25 and 26).

A local APEX County bus line serves the Central City with some service extended into the suburb and nearby areas of the County.

Most travel in APEX County is currently by private automobile. There are approximately 2.1 people per registered automobile in APEX County. This amounts to approximately one billion automobile miles per year. The automobile is the cause of substantial congestion, property damage, death and air pollution in APEX County. Further information about the contribution of the automobile to pollution can be obtained from the APCO.

The automobile represents an immense financial burden to owners, political jurisdictions, employers and commercial establishments. Taxes to expand and maintain the road network are constantly expanding. Vast areas of land are required for parking. At the same time, bus ridership is decreasing. It is readily apparent that no one mode of transportation is adequate or economic and other modes must be considered.

## Transportation Route Studies

Transportation route studies can be ordered by the Planners or other appropriate roles. These studies will help the Planners in determining the cost of a proposed freeway or other transportation system. Route studies are implemented by:

1. Drawing the desired route on a route study map;
2. Coding the coordinates from the map onto the worksheet;
3. Obtaining politician approval and funding for the study.

The computer will then perform the route study calculations and provide the Planners with the data shown on the annotated printout.

An APEX County Base Map with an X - Y grid of 4500 units by 4500 units can be used for drawing desired transportation routes.

Route studies are made available from an independent consultant at the cost of $5,000 per Analysis Area covered by the route. A maximum of two route studies (or 9 AA) can be requested by the Regional Planning Department in any one cycle. Payment for the route study must be made by the Politicians through a cash transfer to the consultant (role advisor).

To requisition a route study, the Planner merely draws the proposed route clearly on the map and then transfers the route coordinates to the Route Study Worksheet. The route in each analysis area is put in on a separate line on the worksheet. It is vital that coordinates for the points at which a route crosses analysis area boundaries be entered on the sheet as the last entry of one row and the first entry of the next row in the next analysis area.

The Planner will receive printout for each analysis area similar to the attached sheet titled Highway Alignment Analysis Data. The printout sheet shows the right-of-way cost for the transportation route and the construction costs of the freeway segment. The total cost of the freeway segment in that analysis area and the total freeway route cost for all analysis areas traversed are also given.

If the transportation mode of interest is not freeway but one of the other transportation projects on the project sheet (personal people mover, elevated subway, monorail, busway, etc.), only the right-of-way costs from the route study is used to calculate route cost. The remainder of the transportation mode cost is taken from the project list costs.

EXAMPLE:

Route Segment "A"
From Highway Alignment Analysis Data:

AA 26

Length of Proposed Highway in this AA - 1.31 miles

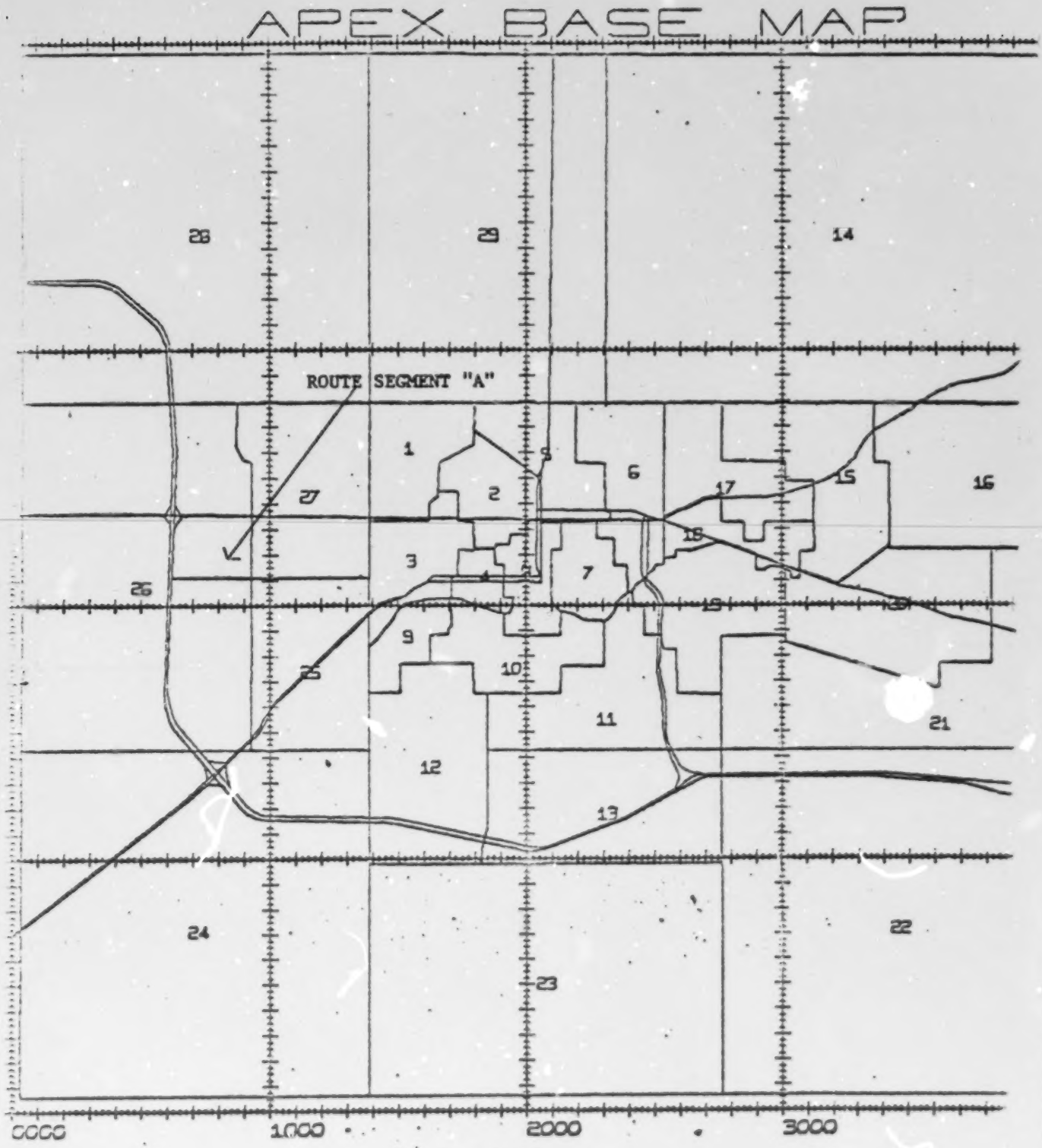
Total Right-of-Way Acquisition Cost in this AA - $146,326

From Project List:

| | |
|---|---|
| Roadway construction costs in this AA - | $1,312,208 |
| Cost of street crossings in this AA - | 131,220 |
| Total construction costs - | 1,443,429 |
| Total Cost for this AA Segment- | $1,539,755 |

This is repeated for each AA traversed by the route and total route cost is the sum of costs of all AAs traversed.

If the proposed route is accepted and funded by the County Board of Supervisors, the required information must be entered on the Regional Planning Department Worksheet "Recomendations for Transportation Capital Project" and be signed as accepted by the County Board. The Politicians must then enter the proper Capital Project Number (in this case 21), Location and Cost on the Politicians worksheet (page 5-8, item 8). The project must be entered separately for each analysis area traversed by the transportation route. The Politicians Capital Budget will automatically be charged for the right-of-way acquisition costs for the route.


APEX BASE MAP
ROUTE SEGMENT "A"
28
29
14
27
1
2
6
17
15
16
3
7
18
26
19
9
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12
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24
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23
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FIGURE 1.

RECOMMENDATIONS FOR TRANSPORTATION CAPITAL PROJECTS

Cycle _____ (Note D)

Route No. A (Note E)

| PROJECT NUMBER* | AA* | PROJECT TITLE | ACRES REQD. | TOTAL COST* | COUNTY BOARD APPROVAL |
|---|---|---|---|---|---|
| 21 | 26 | Construct Freeway Segment | 2 | 1,539,755 (Note B) | (Note C) |
| | | (Note A) | | | |
| | | | | | |
| | | | | | |
| | | | | | |
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Note F — Special Grants _____

Note G — City Contribution _____

Total Cost (recommended) $_____ (Note H)

Total Cost (approved) $_____ (Note I)

Total County Cost $_____

Note A Information from project list

Note B Calculated from Route Study printout information and project list cost per mile. See Chapter 8 of this supplement.

Note C County Board line item approval

Note D If Route Study and information are returned, the projects may be implemented in next cycle.

Note E From Route Study. See Chapter 8 of this supplement.

Note F Grants from federal & state

Note G City would normally bear part of cost.

Note H For all projects listed here

Note I For approved projects

REGIONAL PLANNING DEPARTMENT

Route Study Worksheet

Route No. "A" (Highway)

Route Coordinates (from APEX Grid Map)

| | AA | X1 | Y1 | X2 | Y2 | X3 | Y3 | X4 | Y4 | X5 | Y5 | X6 | Y6 | X7 | Y7 | X8 | Y8 | X9 | Y9 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Start Route | 26 | 900 | 2100 | 800 | 2100 | 700 | 2100 | 600 | 2100 | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
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180

Note A

HIGHWAY ALIGNMENT ANALYSIS DATA
ANALYSIS AREA 26

TOTAL MARKET LAND IN ANALYSIS AREA-- 15197.48 ACRES
LENGTH OF PROPOSED HIGHWAY IN THIS ANALYSIS AREA-- 1.31 MILES ← Note B
THE RIGHT-OF-WAY FOR THIS SEGMENT WOULD TAKE 47.71 ACRES ← Note C
WHICH IS 0.3 O/O OF THE MARKET LAND IN THE AA.

| | DEVELOPED | | | VACANT | |
|---|---|---|---|---|---|
| LAND USE | ACRES | UNITS | $/UNIT | ACRES | $/ACRE |
| R1 | 1.38 | 1.21 | 38500. | 2.35 | 12000. |
| R2 | 0.81 | 1.41 | 21900. | | |
| R3 | 0.50 | 1.40 | 17500. | | |
| M1 | 0.30 | 1.53 | 24500. | 0.11 | 12000. |
| M2 | 0.21 | 1.77 | 14700. | | |
| CL | 0.00 | 0.00 | 136000. | 0.00 | 35000. |
| CR | 0.00 | 0.00 | 192914. | | |
| IE | 0.02 | 0.02 | 109179. | 0.00 | 10000. |
| IX | 0.00 | 0.00 | 155400. | | |
| OD | 0.00 | 0.00 | 86000. | 0.47 | 35000. |
| AD | 41.52 | 41.52 | 600. | 0.00 | 480. |

← Note D

| | | |
|---|---|---|
| THE AVERAGE VALUE PER ACRE IN THE ANALYSIS AREA IS | $ 3066. | |
| TOTAL RIGHT-OF-WAY ACQUISITION COST IN THIS AA | $ 146326. | ← Note E |
| ROADWAY CONSTRUCTION COST IN THIS AA | $1312208. | ← Note F |
| COST OF STREET CROSSINGS IN THIS AA | $ 131220. | ← Note F |
| TOTAL CONSTRUCTION COST IS | $1443429. | ← Note G |
| TOTAL COST OF HIGHWAY SEGMENT IN THIS AA IS | $1589755. | WHICH IS $1211511. PER MILE |

| | |
|---|---|
| Note A | Planners' Printout from Route Study Request |
| Note B | Calculated from coordinate input |
| Note C | 300 ft. wide by 1.31 miles long |
| Note D | Summary of developed and vacant market land which would be used for right-of-way |
| Note E | Total cost of right-of-way |
| Note F | Highway construction costs |
| Note G | Sum of highway construction costs |

A Suggested List of Transportation Capital Improvement Projects

All of the following projects would appear under the budget category STREETS, could be located in any analysis area, and would not be funded by revenue bonds. If a minus one is entered in the acres field then this will require the number of acres to be entered on the F-2 field of the CP card. If GOD wanted to affect the access coefficients, then he would have to replace the current project 21 found on the project list with one of the following:

(a) Construct 1 mile Personal People Mover - Jurisdiction-wide impact - Enter a -1 in the acres field - 2 cycles to run with a minimum cost of $2,000,000 and a maximum cost of $4,000,000.

(b) Construct 1 mile Elevated Subway Mass Transit - County-wide impact - Enter a -1 in the acres field - 5 cycles to run with a minimum cost of $5,000,000 and a maximum cost of $10,000,000.

(c) Construct 1 mile Monorail Mass Transit - County-wide impact - Enter a -1 in the acres field - 3 cycles to run with a minimum cost of $6,000,000 and a maximum cost of $12,000,000.

(d) Construct 1 mile 2 Lane Busway - County-wide impact - Enter a -1 in the acres field - 2 cycles to run with a minimum cost of $1,500,000 and a maximum cost of $3,000,000.

(e) Freeway-Computer Surveillance Traffic Control - County-wide impact - zero acres required - 8 cycles to run with a minimum cost of $500,000 and a maximum cost of $1,000,000.

A Suggested List of Special Programs Dealing with Transportation

(a) Dial a Bus Service - available for the county - 3 cycles to run - $50,000 cost per year and requires capital project 114.

(b) Mass Transit Subsidy - available for the county - 2 cycles to run - $95,000 cost per year.

(c) Auto Emission Inspection Program - available for the county - 3 cycles to run - $300,000 cost per year.

(d) 20 passenger minibus (10 buses) - available for any Jurisdiction - 5 cycles to run - $90,000 cost per year and requires capital project 20.

(e) Consultant/Transportation Route Study - available for the county - 1 cycle to run - $15,000 cost per year.

XIII.

Cycle No. _____

GRANT APPLICATION FORM
(General)

A. STATE FEDERAL Funds requested (circle one)

1. _____ 2. _____
Name of Applicant Authorized Signature

3. _____ _____ 4. $_____
Date, Cycle, Time of Request Total Amount Requested

5. _____ New Applicant 6. Length of Funding _____Yrs/mo.

7. _____ Continued Funding _____ $_____
Title of previous grant Amount

---

B. 1. Grant or Project Title _____

2. Justification of the Proposal:

_____

_____

_____

_____

_____

_____

3. How will the funds be used: (Be Specific)

_____

_____

_____

_____

_____

_____

4. Funds Distribution:

_____ $_____

_____ $_____

_____ $_____

_____ $_____

_____ $_____

_____ $_____

_____ $_____

5. Other Funds to be used in carrying out this Proposal:

_____ $_____

_____ $_____
Source Amount

---

C. 1. Impact of the Proposal: (Positive)

_____

_____

_____

_____

_____

_____

2. What could reasonably be expected to happe , if anything, should this proposal be rejected:

_____

_____

_____

_____

_____

_____

FOR OFFICIAL USE ONLY

Action:

_____Reviewed _____Request Clarification of Item

Comments: _____

_____

_____

Matching Funds:

Ratio_____ Amount $_____

Funding:

_____Approved Amount $_____

_____Not Approved Reason _____

_____

_____

Submitted to Appropriations Committee with Comments:

_____

_____

_____

Signatures: (Titles) Dates:

_____ _____

_____ _____

_____ _____